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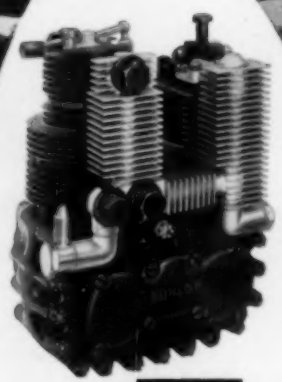

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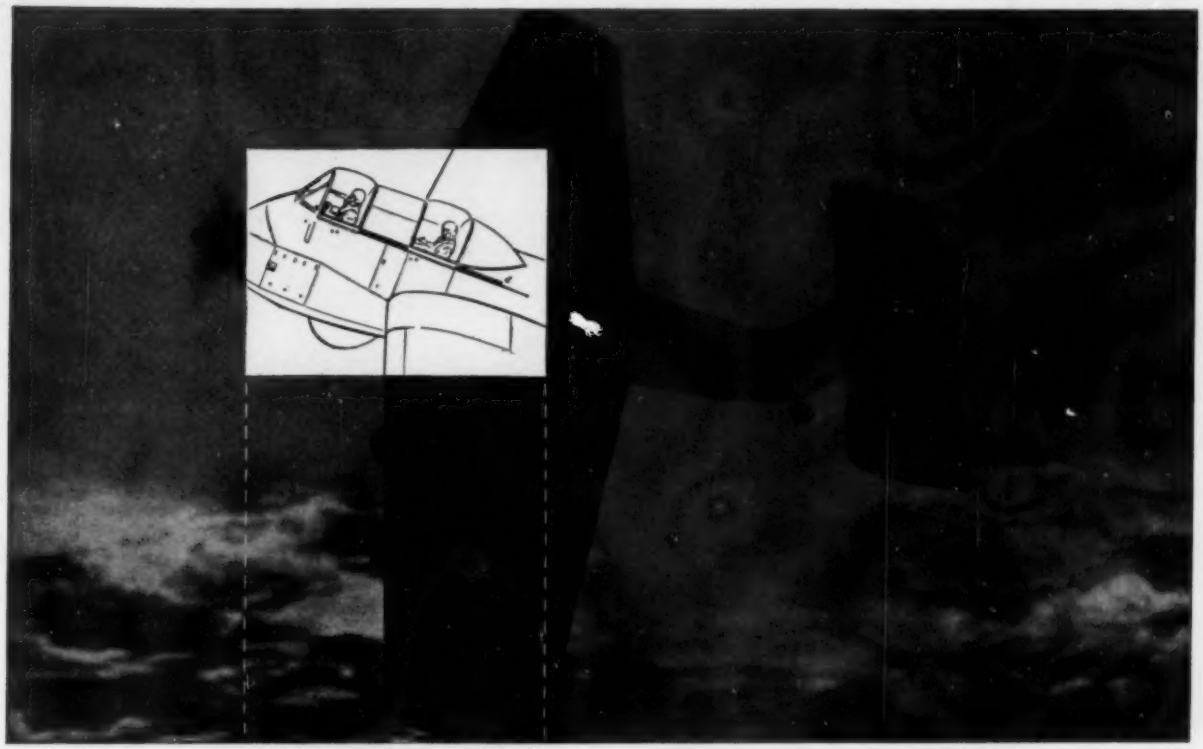

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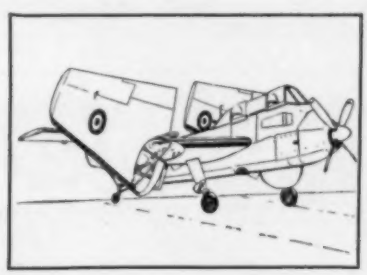

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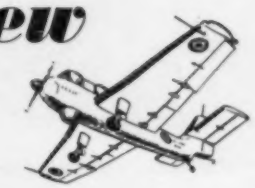

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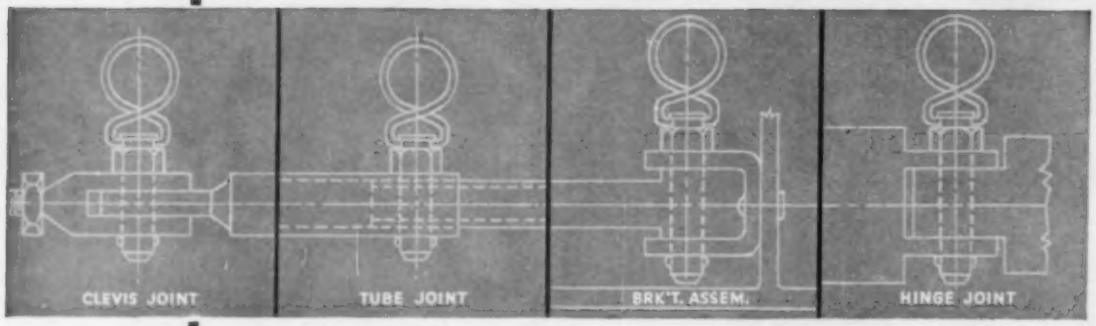

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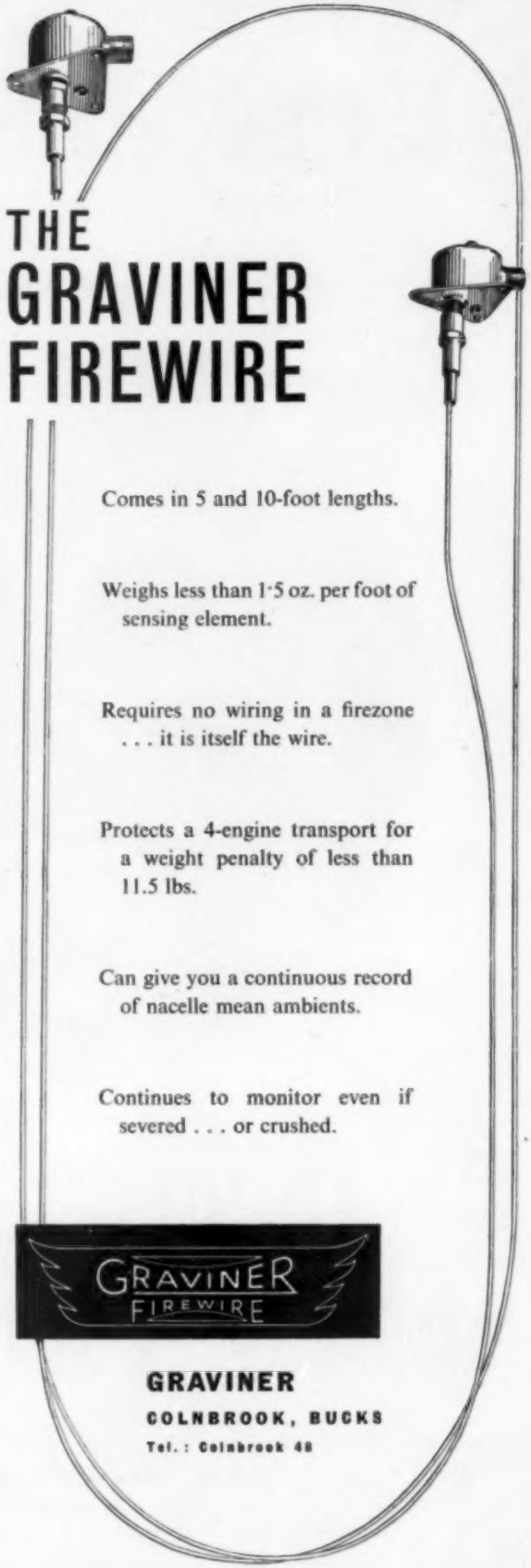

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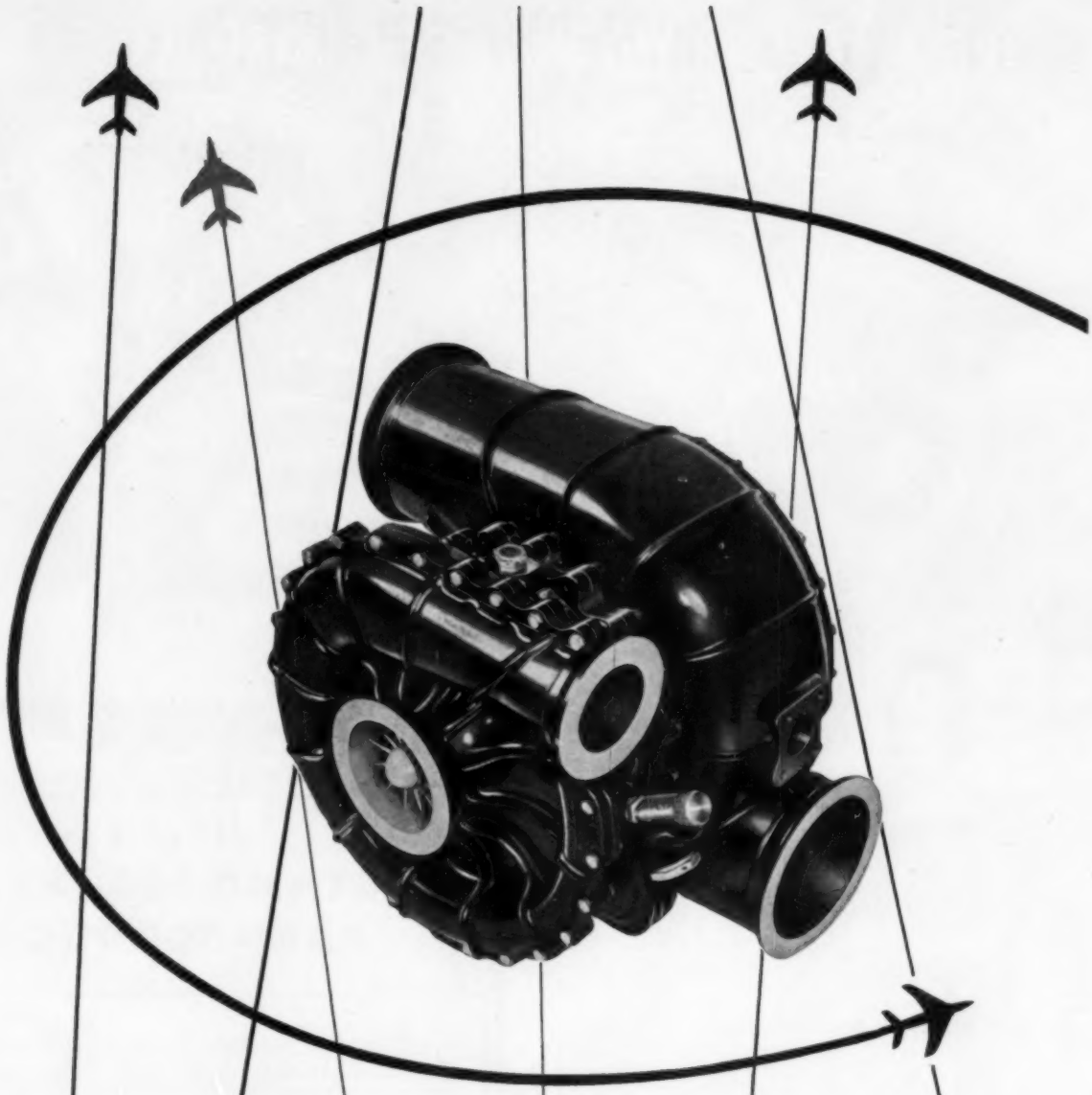

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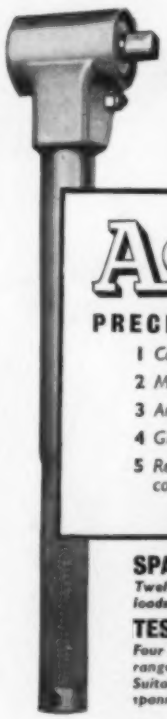

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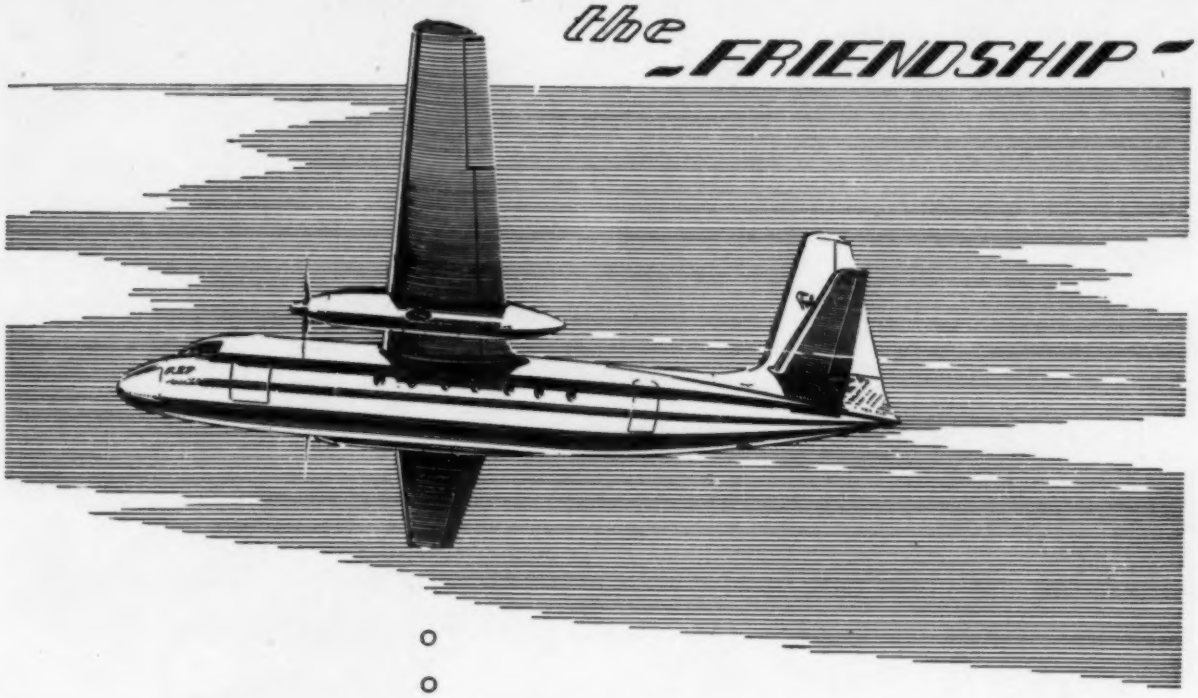

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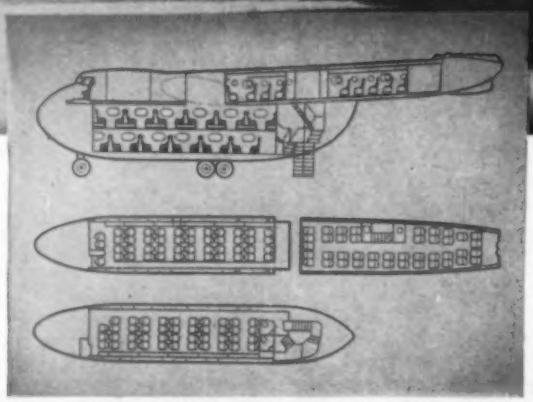

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Founded 1909

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Gas-Turbine Promise

ABROAD, if not at home, the belief has been growing that this country is not managing to hold her long lead in the design and construction of gas-turbine engines. This impression we believe to be ill-founded, although we can think of reasons for it. There is no doubt, for example, that from having few gas turbines worth twopence, America has lately developed and produced some good ones—more particularly the J57. The turboprop picture over there can also be described as looking more promising in both medium and large categories. (In fact, in a few years' time America may have a monopoly in five-figure-powered turboprops.) These happier circumstances have naturally been well publicized.

On our own side of the picture may be cited the appreciably tighter security and greater commercial secrecy which is being observed by the principal British engine manufacturers. We look forward to the days when we can describe the Conway, the Gyron, late marks of Avon and Olympus, the successors to the Proteus and Dart, the Oryx, and other units about which no hint, even, may be given. In this issue we are able to describe in detail a most promising and eminently sensible turboprop design from Napiers. Conceived in 1950, it embodies much practical experience and sets new standards for efficiency, installed drag, and accessibility.

With the exception, perhaps, of the very small gas turbine—a gap which is partially closed by a licence to build French Turboméca units—British designers have provided for every reasonable requirement, including the jet basic trainer for which the light and simple Viper seems to be ideal.

Developments

No sooner does it appear that a period of consolidation can be contemplated than completely new needs arise. It has been suggested that Great Britain is extravagant in the number of engine types designed and developed, in view of the relatively small numbers of each for which there is a potential market. Again, we do not agree; for every good engine there is a worth-while application, and for the best—we may cite the Avons—there are firm orders for thousands. Engine designers can fairly claim that in this country they are generally keeping technically ahead of airframe capacity as well as leading the world in their field.

Engine manufacturers are now squaring-up to a new series of problems, namely those involved in the requirement for supersonic military aircraft. In their aerodynamics, supersonic turbojets differ markedly from subsonic units and approach more closely to the ramjet. Intake design becomes of extreme importance and compressors begin progressively to have fewer stages; this is, of course, because the ram effect resulting from very-high-speed flight provides a natural source of compression. The Gyron is believed to be the first turbojet in this category. It already has many hours of running experience.

The future of afterburning, widely employed in America, is not easily foreseen; is it a passing phase, or will some kinds of turbojet continue to require reheat? There is a school of thought in this country that reheat is something of an expedient which will not be needed on new, very-high-powered jet units. Certainly reheat has its defects; complicated variable-area nozzles are essential, it is extravagant, it is heavy, and it presents installation and cooling problems in the rear fuselages of fighter aircraft. Special reheat fuels may possibly be introduced in the near future to obtain the required flame characteristics in very-fast-moving gas streams. The complication of a separate fuel system and pumps would have to be accepted in return for more power and simpler burners and rings than those now required.

British rocket motors and ramjets are still just over the security horizon, but the first development rocket motor to be revealed—the A.S. Snarler—will be the subject of a description in a week or two's time. A successor has been named unofficially but no production has been mentioned as yet. The same remarks apply to at least one other rocket prime mover.

All our engine developments are dependent upon continuous and expensive research and upon the provision of test facilities, tools, and new and improved materials. Yet such expense is wholly justified and will be returned with interest as new power units contribute to home security and foreign sales and licensing contracts.

HIGH, WIDE AND HANDSOME above Puget Sound rides Boeing's Model 707 Stratotanker/Stratoliner prototype. The aircraft is seen on its maiden flight (described on page 125), and is flying with its trailing-edge flaps at landing setting. Its lines may be compared with those of the Comet 3 (opposite), which made a slightly longer first flight just four days later.

FROM ALL QUARTERS

The Duke Inspects R.A.F. Valiant

THE first indication that a Vickers Valiant is in the hands of the R.A.F. came last week when it was made known that H.R.H. the Duke of Edinburgh had inspected one of these machines during a visit to R.A.F. Station Wittering. He is said to have discussed the aircraft with its captain, S/L. Roberts. The Duke had previously flown to Wittering from Hendon in his Devon.

No great powers of observation have been needed to discover that several Valiants have now been produced and that the R.A.F. are preparing to form squadrons of this first V-bomber. Part of the R.A.F.'s airfield-reconditioning programme is believed to have been in readiness for Valiants and no doubt a commander and some crews have already been earmarked for the first squadron. A completely new training scheme will be required for this first four-jet aircraft to be delivered to the R.A.F., but it seems likely that squadron will be formed this year.

A Test Pilot Honoured

W/C. Heyworth.

THE Guild of Air Pilots and Air Navigators announced last week that the first award of the Derry and Richards Memorial Medal for experimental flying has been made to W/C. J. H. Heyworth, A.F.C., "for his outstanding record in the field of turbojet engine development flying."

W/C. Heyworth—who retired from active flying last May and went over to the sales-promotion side of Rolls-Royce, Ltd.—began test flying with the Derby company in 1937. His duties embraced the testing of numerous types of piston and jet engines (the latter including pioneer W2B engine in the tail of a Wellington in 1942) and culminated in the development flying of the RA.14 in a Canberra in 1953. In 1946 he was awarded the Air Force Cross.

In the course of his experimental flying, W/C. Heyworth has flown almost every prototype aircraft to be fitted with Rolls-Royce engines and can claim to have been the first pilot in the world to amass 1,000 hours of gas-turbine flying.

The Derry and Richards Medal was sponsored by the employees of the de Havilland Aircraft Co., in memory of the D.H. test pilot and flight-observer who lost their lives in the 1952 Farnborough Display accident. It is awarded annually by the G.A.P.A.N. "to a pilot, not on active service in the regular forces but professionally engaged in flying for the testing or development of British Aircraft, whose flying has been of outstanding value."

Loss of the Victor

ON Wednesday, July 14th, the first prototype Handley Page Victor, WB 771, was completely destroyed at Cranfield, Beds. The aircraft was carrying out position-error trials, and had made numerous runs at about 100ft altitude (the "sea-level" case) each at a higher airspeed than the one previous. At about 1 p.m. the bomber was approaching the airfield at this height when it was seen to be behaving erratically. Eye-witnesses stated it made a sudden dive and then levelled out again, and that at this stage the whole horizontal tail assembly was fluttering badly. The complete tailplane and elevators then broke away and rose above the flight-path, while the remainder of the aircraft went straight into the ground at full power, striking exactly at the intersection of two runways.

Disintegration was complete, and appears to have been accompanied by fire, although the spread of the wreckage obviated any conflagration in the normal sense of the word. The horizontal tail surfaces came to rest on the airfield; they were substantially intact and may therefore yield valuable evidence.

None of the crew of four escaped. The aircraft was being flown by the company's deputy chief test pilot, F/L. R. V. Ecclestone, D.F.C., A.F.C. Thirty-one years of age, he flew Stirlings and Lancasters in Bomber Command, and also Hurricanes and Spitfires in the Bomber Defence Tactical Unit. Later he was engaged in development flying, successively at Marham, Boscombe Down and Farnborough; he had completed the Empire

OVER THE SEA TO SKY: Dramatic departure, from a launching site in Malta, of a French SFECMAS Ars 5.501 pilotless target (the parentage of which is too obvious to warrant comment), one of a number now being tried out by the Royal Navy. They have radio control: weigh about 15 cwt and are launched with the aid of booster rockets, which fall away about 300 yd from the ramp. A parachute aids recovery from the sea.

Test Pilots School course and had served for a year in the Directorate of Operational Requirements at the Air Ministry. He had joined Handley Page, Ltd., less than three months before the accident.

Also on board were Mr. E. N. Kenneth Bennett, 29, the company's chief flight observer (he joined them in 1946); and two other H.P. observers, Mr. Bruce Heithersay, 28 (ex-R.A.A.F.), and Mr. A. B. Cook, 24 (formerly with Aero Research, Ltd., and Glosters).

On learning of the accident, Mr. Duncan Sandys, Minister of Supply, sent telegrams of condolence to Sir Frederick Handley Page and to the next-of-kin of the crew. Mr. Sandys also made a brief statement on the crash in reply to a Commons Question on Monday last.

The Victor first flew on Christmas Eve 1952. During the early part of this year it was returned to Radlett for extensive modification. The second prototype is now virtually complete, and is having functional tests.

W. G. Carter Retires

THE retirement of one of this country's leading aircraft designers was announced last week. He is Mr. W. G. Carter, C.B.E., F.R.Ae.S., who, at the age of 64, retires from the post of technical director to the Gloster Aircraft Co., Ltd. His place on the Board will be taken by Mr. R. W. Walker, F.R.Ae.S., chief designer since 1948, but he will remain available to the company in a consultative capacity.

Mr. W. G. Carter.

Mr. R. W. Walker.

After general engineering experience early in the century, Mr. Carter entered aviation as chief draughtsman with the Sopwith Aviation Co. during World War I, and from 1920 to 1924 was chief designer to their successors, the Hawker Engineering Co. In the late twenties he performed special design work for Short Brothers and for de Havillands; and in 1931 he joined Glosters, where he was in charge of D.H. 72 bomber design and construction, which the company had taken over from de Havillands. In 1935 he went to another unit of the Hawker Siddeley Group, the Avro company, to supervise design on the Manchester project, returning to Glosters a year later to be appointed their chief designer. He was thus in charge of design when the pioneer E.28/39 jet aircraft emerged, and he was also responsible for the Meteor.

His successor, Mr. Walker, who is now 54 years of age, has been closely associated with the design and development of these same Gloster aircraft, up to and including the Javelin, since he left Hawker Aircraft in 1937, where he had been assistant chief designer. Before that he had extensive technical experience, first in the R.A.F. (1918-19); at the Royal Aircraft Establishment; with Blackburn Aircraft; and—after an initial eight years with Hawkers, from 1925 to 1933—with the Swedish company which had taken over manufacture of the Jaktfalk fighter and other aircraft of Svenska Aero A.B. He re-joined Hawker Aircraft in 1935.

Mr. Sandys on V.T.O.

THE question of research into methods of vertical, or near vertical, take-off by aircraft was raised in the House of Commons last Monday by Mr. Frank Beswick (Lab., Uxbridge).

The Minister of Supply, Mr. Duncan Sandys, replied that his Ministry had given contracts to a number of firms to undertake research into various methods of vertical, or near vertical, take-off. Engines and airframes suitable for this purpose were being developed.

Mr. Beswick drew attention to the fact that elsewhere in the world development was "pretty far advanced," and asked the Minister to see to it that there was no question of money shortage to delay the development of what might well be one of the most important types of machine.

Mr. Sandys replied that he well realized the importance of this work. Quite a lot of money had already been spent on it, and the amounts being spent were moving up fairly steeply. All this research into vertical and near vertical take-off had, of course, very important military applications, and for that reason he did not want to go into details as to exactly what was being done in this country and how much progress had been made.

Rolling in the Aisles

TWENTIETH CENTURY FOX gave a most stimulating demonstration in Cinemascope to an invited audience in London last week. A short colour film, entitled "Movie Stunt Pilot," provided by far the most realistic (and at times startling) impressions of flying that we have ever seen. The very broad screen gives an entirely natural panorama and horizon which definitely has the effect of lifting the viewer into the air. Other experienced pilots, from airlines and the aircraft industry, confirmed that they, too, had felt as though they were flying. The aerobatic sequences are actually giddy-making, and the high-speed, low-level shoot-up in a Sabre is most exciting.

The man chiefly concerned in the film is Paul Mantz, professional stunt pilot, whose private circus of veteran and modern aircraft has appeared singly or severally in many films. For three consecutive years he won the Bendix Trophy Race in his Mustang.

The possibilities of Cinemascope in association with flying are obviously many, and one could think at once of valuable applications for training purposes and familiarizing pilots with areas of country and approaches to airfields and objectives—quite apart from the increased opportunities for air-travel talks.

This short film will be released at the Carlton theatre, London, early in August together with the main feature, *Three Coins in the Fountain*, also in colour Cinemascope and containing a short but superb sequence taken from an aircraft approaching Venice.

IN HER ELEMENT: the de Havilland Comet 3 took to the air for the first time last Monday, July 19th, at 5.30 p.m., returning to Hatfield 85 minutes later. "She behaved perfectly," reported John Cunningham, chief test pilot, who was accompanied by P. Bugge (co-pilot), E. Brackstone Brown (engineer), A. J. Fairbrother (observer) and J. Marshall (instrument engineer). Loaded to about 58 per cent of the designed gross weight (150,000 lb), the new Comet took off in only 500 yd. and reached a height of 15,000ft during the maiden flight.

SEA VENOMS IN SERVICE

No. 890 Squadron Works Up on Its FAW.20s

AT H.M.S. *Heron* (Royal Naval Air Station Yeovilton), on March 20th this year, No. 890 Squadron, Fleet Air Arm, was re-formed and became the first Naval squadron to fly the de Havilland Sea Venom FAW.20 all-weather fighter. Since delivery of the aircraft began the unit has been working up to its somewhat complex operational duties. When this work is finished, the squadron is due to embark in one of the new fleet carriers. The commanding officer is Lt.-Cmdr. A. Gordon-Johnson.

No. 890 Sqn. was first formed—at Eastleigh—on May 20th, 1942, and moved to Halifax, Nova Scotia, in the following month to take delivery of six Grumman Wildcats. It returned to the United Kingdom in December of that year in the escort carrier H.M.S. *Battler*, after working up at a U.S.N. airfield in Virginia. During the first months of 1943 the squadron was based at Donibristle and at Hatston, in the Orkneys, and finally embarked in H.M.S. *Illustrious* with eight Wildcats to act as fighter protection for Force "Able" off Norway. *Illustrious* sailed for the Mediterranean and, after a journey to Malta, joined Force "H." The squadron gave fighter cover and support for troops engaged in the Salerno landings in September. Late that year it returned to Port Ellen, in the Western Isles, and then to Eglington, where its strength was increased to ten aircraft.

In 1944 it was transferred to Ceylon, and embarked in H.M.S. *Atheling* for operations against the Japanese. It was finally disbanded in Ceylon on August 1st, 1944.

No. 890 was first re-formed after the war as a fighter squadron with Attacker F.1s at R.N.A.S. Ford in April 1952. In October of the same year the unit went to sea in H.M.S. *Eagle*, and in December it was again disbanded.

Last week we were permitted to see some of the work the squadron is doing at Yeovilton and were treated to an exhibition of flying which gave some indication of the capabilities of the aircraft. The Sea Venom FAW.20 has been developed from the original Venom single-seat fighter (now in service with 2nd T.A.F. in Germany) through the R.A.F.'s Venom NF.2, to which it generally corresponds in operational equipment. Normal Naval requirements, however, have led to the fitting of a considerable amount of special equipment in the form of launching and arrester gear and wing-folding mechanism which have naturally brought with them small penalties in general performance. Though its loading has given it a fairly high stalling speed, it was noticeable last week that it could be operated very comfortably from a 3,000 yd runway.

"Flight" photograph

Ratings refuel one of the Sea Venoms after the demonstration flight described on these pages. The operation is normally carried out with the wings folded.

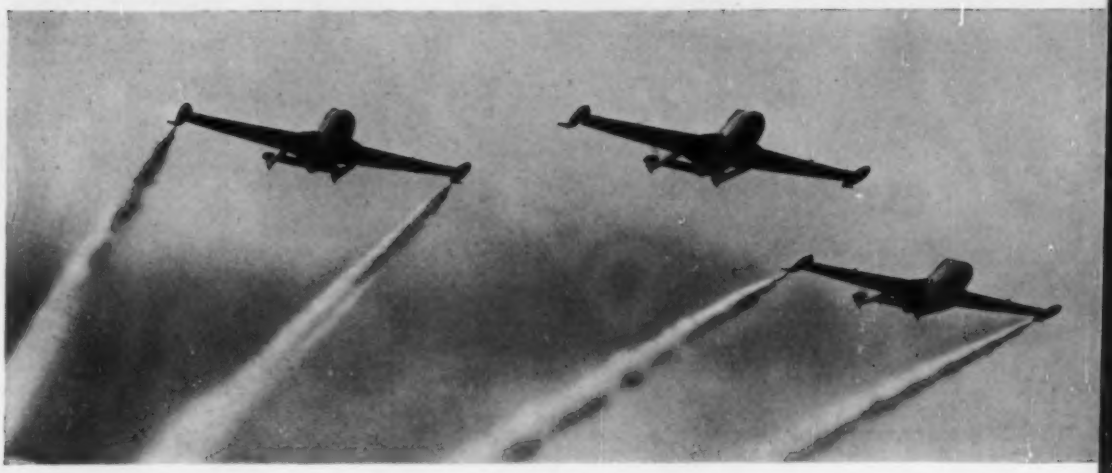
Basically the Sea Venom is an all-weather fighter designed for either night or day operations, but it is also capable of normal day fighter, ground-attack and anti-shipping day-and-night strike duties. The squadron's training, therefore, includes practice in battle formations as well as in individual operations. For the ground-attack rôle the aircraft can be fitted to deliver eight rockets.

Although the standard means of launching is by catapult, for which purpose two hooks are fitted under the wings, just outboard of the air intakes, provision is also made for rocket-assisted take-off. The arrester hook is fitted at the apex of a hinged "vee" strut, so that the assembly can swing up into the familiar sting-like fairing above and behind the tail-pipe of the Ghost engine. All Sea Venoms have the modified wide-chord fin and rudder, compressibility fairing bullet at the fin-tailplane intersection, and extended tailplane. Of the A.I. radar equipment, of course, nothing may be said other than that it is of the standard type for NATO air forces.

No. 890's Venoms are not fitted with ejector seats, and the crew sit side-by-side, but with the observer slightly behind and to the right of the pilot. The observer wears a back-type parachute. Both crew members' positions are fitted for pressure breathing and g-suit, still rare in British fighter aircraft. All No. 890's aircrew are also issued with British crash helmets, g-suits, pressure-breathing waistcoats, string vests and immersion suits. The last-named items are designed to be worn in the aircraft and are therefore made of a porous cloth which, when immersed, seals itself; boots are integral with the suit, wrists and neck sealed with rubber glands, hoods attached, and gloves separate. The usefulness of the immersion suit obviously depends upon the ability of the crew to get clear of their twin-boom aircraft. At present only the hood can be explosively jettisoned, but ejection seats may be fitted later.

The squadron put on a short flying display for the benefit of the visitors to Yeovilton. Five aircraft started up and took off for a series of low formation runs over the airfield and the commanding officer then flew past alone to show off the undoubtedly

Three of No. 890 Squadron's Sea Venoms reach momentarily into the clear upper air at the top of a formation loop.



Sea Venoms blow wing tanks to jettison fuel (right) and taxi out for take-off after and before extending wings. They are normally parked, as they would be aboard ship, with wings folded.

"Flight" photographs

high speed of which the Venom is capable, after which the squadron re-formed and made a stream landing.

The whole demonstration was carried out with great precision. The crews were first briefed, watches synchronized and the cartridges hissed and smoked in unison ten minutes later. The Venoms were parked with wings folded, and just before the start the ground crews moved away, leaving the aircraft silent and still, the hoods locked shut and asbestos cloths flapping gently over the tailplanes; these cloths prevent scorching of the surfaces by the initial blast from the jet-pipes (otherwise there might be adverse effects on the high-speed characteristics of the aircraft).

The Sea Venoms taxied out to the accompaniment of the piercing squeal of their Ghosts, unfolded their wings immediately and moved in close formation to the runway threshold. They took off in a vic of three and a pair. After initial runs to a vic of five, Nos. 1, 2 and 3 alone flew past, with the outside aircraft jettisoning fuel by "blowing" their tip-tanks and leaving a thick stream of kerosine vapour from each tank. The final circuit before landing was at low altitude, as is the Naval custom, and the touch-down closely spaced and followed by a fairly long run. As the aircraft taxied in, wings were simultaneously folded at a word of command from the leader.

Altogether it was an impressive display of air drill and the aircraft appeared to be tractable and smooth to fly although they are not yet fitted with the powered ailerons which will be standard on the Sea Venom FAW.22. Control is reported to be good, although fine control movement may be influenced by wing-flexing when the tip-tanks are full.

The pilots reported that the Sea Venom was comfortable to fly in and its performance, especially at altitude, up to Venom standard, though no exact figures may be mentioned. It is capable of carrying out a number of widely varied offensive and defensive duties and should prove a most useful addition to the carrier's armament and to the defence of the fleet and of convoys. Meanwhile, the working-up process continues apace, with night and day flying almost evenly divided. A second squadron, No. 809, is also at Yeovilton working-up, and others will follow.

Five of the squadron's aircraft fold their wings in unison while taxying in after a stream landing. The power-folding sequence is nearing completion.

"Flight" photograph

As the "Wingco Flying" briefs Canberra crews at Wittering, Marshal of the Royal Air Force H.R.H. the Duke of Edinburgh (third from left) listens intently. At extreme left is G/C. W. P. Sutcliffe (station commander); on the Duke's right is Air Marshal Sir George Mills, A.O.C-in-C. Bomber Command, and on his left, Air Vice-Marshal E. C. Hudleston (A.O.C. No. 3 Group).

Eight Thousand Sorties Against Great Britain in this Year's Big Air Defence Test: Phase 1 Described

EXERCISE DIVIDEND

THE first phase of the 1954 air defence exercise, code-named "Dividend," took place last week-end and the second phase was due to begin yesterday at 1400 hr. It will close at 1700 hr. on Sunday.

At a Press conference held before the exercise opened, Air Marshal Sir Dermot Boyle, A.O.C-in-C. Fighter Command, said that it was by far the biggest air defence exercise held in Britain since the war. Comparing it with "Ardent" (1952) and "Momentum" (1953), he pointed out that two years ago our radar facilities and both bomber and fighter forces were considerably smaller than they are now. In "Ardent," he said, the bomber forces were equipped with piston-engined aircraft, in "Momentum" 50 per cent jet aircraft were used and this year that figure is up to 75 per cent.

An entirely new idea this year, the Air Marshal explained, is the further sub-division of the phases into missions with short intervals between. When all the attacks associated with any one mission are completed, the Command and Sector Controllers are given maps showing exactly what has happened and are thus able to rectify faults as the exercise progresses. It is felt that this may easily save the dead period between annual exercises for new ideas to be tried and perfected.

The theme of "Dividend" is very simple; it is air defence against atomic-bomb attack. As Sir Dermot told his listeners "Any complicated story concerning operations by other forces could confuse the issue, perhaps to a dangerous extent. *For instance, operations by land or maritime forces not directly concerned with the air defence of the United Kingdom must not be allowed to cloud our vision or influence our actions.*"

During the whole exercise it is expected that 8,000 sorties will have been flown against Great Britain. These are being made by Bomber Command, 3rd Air Force U.S.A.F., 49th Air Division U.S.A.F., 7th Air Division U.S.A.F., A.A.F.C.E., (2nd A.T.A.F., 4th A.T.A.F.), Fleet Air Arm, Flying Training Command and No. 81 Group, Fighter Command. Although many of these are operating from Continental bases the Continental early warning radar system is tied in with that of this country.

On the defence side alone some 80,000 men—and women—are engaged. Included are the Regular and Auxiliary squadrons of Fighter Command, Control and Reporting stations, Auxiliary Fighter Control units, Royal Observer Corps and A.A. units. This is the first exercise on which the new reserve flights, formed earlier this year, have been engaged.

Coastal Command are operating in their normal maritime rôle in connection with Haul, a naval/air exercise which is taking place concurrently with Dividend. In addition Coastal Command, U.S.A.F., Fleet Air Arm and Flying Training Command are operating an extensive search and rescue service.

The first parts of Phase 1 were severely limited by bad weather, but the all-weather fighters were able to operate successfully against the small forces in the northern and southern approaches. The major attacks were by Canberras against targets in the north, and for the first time the Hunter appeared as part of the defence, making interceptions at over 40,000ft.

From early Sunday morning until the end of Phase 1 improved weather enabled the exercise to go ahead on the full planned scale. Three main raids were directed against the northern, eastern and southern sectors of the country at heights of 35,000ft to 40,000ft. F-86s and F-84s of A.A.F.C.E. were over Britain in strength throughout the day and Fleet Air Arm strike aircraft raided coastal targets. The phase finished with another three major raids against northern, southern and eastern areas. Some sidelights on the exercise, by members of *Flight's* staff, are given below.

Expectancy at Biggin Hill

THE atmosphere at Biggin Hill during the first phase of "Dividend" was quiet—too quiet for many of those present. As luck would have it, the weather turned foul during the night and practically stopped all flying during Saturday, the first day for the Auxiliary Meteor Squadrons. A small number of sorties was indeed flown, but pilots reported cloud from 400ft to 28,000ft; "trade" was scarce and the return to base not a comfortable affair.

The three R.Aux.A.F. squadrons based at Biggin for the exercise, Nos. 600 (City of London), 615 (County of Surrey) and 500 (County of Kent), were due to come into action at 1400 hr on Saturday, but sufficient pilots were on hand early in the morning to begin operations immediately. Apart from bad weather, however, most of the "war" appeared to be concentrated in any sector but Biggin's and the day ended with the loudly reiterated hope that the morrow would bring bigger and better things.

In expectation, it was arranged that aircraft and pilots should stand by at 0400 next morning, after met. briefing at 0345. This time the weather proved considerably better, with a cloud-base at about 1,200ft and good visibility. But again the "war" was hottest in the north and west, and tactical considerations evidently made it inadvisable to commit too many forces from the Biggin area. Some activity developed in the early morning, but without any conclusive engagements, and the pace soon settled into one of interminable readiness periods followed by not over-active sorties. "Dinghy-bashing"—sitting in the cockpits at readiness—was in fact the principal occupation of those fortunate enough to get that far. Once in the air, one Meteor section was told to "Make angels 49"; their reply is not recorded.

Though the Biggin picture might sound gloomy, the exercise was in fact taken very seriously, and preparations had been made for almost any eventuality; throughout the week-end the whole of the station personnel were ready for any kind of call on their services. Full security regulations were in force and aircraft widely dispersed. Pilots at readiness took their meals in their cockpits, and operational and flying controls were, of course, fully manned all the time.

This very full preparedness made the lack of any real activity all the more disappointing, though nothing could be held to blame other than the weather and the vagaries of the conflict. Now the members of the Biggin Hill Auxiliary wing must base their hopes of intense "trade" on the events of the second phase, which for them is due to begin tomorrow. C. M. L.

Duxford's Dividend

ONE supposes, without having seen the record, that Duxford's Dividend in the great co-op. was much the same as was doled out to other stations of Fighter Command. Certainly, when we reported to the guard-room last Sunday morning at an hour when any hard-working journalist should still be debating who should fix breakfast, business was at a pretty low ebb. So there was time to relax in the ante-room and prognosticate on the World Gliding Championships with the Flying Wing adj., whose name—F/O. Mallett—is not unfamiliar in motorless circles.

Man's-size coffee cups having been drained, we felt strong

Above a Meteor 8 is seen landing at Duxford, and on the left, at the same station are (left to right) G/C. J. Rankin (station commander), G/C. J. M. Thompson (S.A.S.O., No. 11 Group), and A.V-M. H. L. Patch, the Group's A.O.C. Between the two group captains is discernible S/L. H. Bennett, who commands a Duxford-based Meteor squadron.

"Flight" photographs

enough for the ascent to Flying Control, where S/L. Beck—very wide awake, as is proper to his calling—turned up The Books and reported: Yesterday very slack (weather, of course); eleven sorties in all, but several diversions from other bases (Meteors and Sabres). Thirty-two sorties today (eight sections of four), scrambled against raids coming in from points between the Paris area and the Dutch islands.

The squadron leader gave us a dummy run over his pet movements board, which is of local design and manufacture and displays graphically everything a well-informed flying controller should know. But admirable and ingenious as it is, it set us wondering if something a little more *recherché*—such as the illuminated display in Hawker's Dunsfold (or should it be Blackpool?) tower—might not be more appropriate to a first-rate fighter station.

From this distraction we were shaken by a broadcast concerning three bandits coming in at 32,000ft; and across the airfield we saw two sections of camouflaged Meteor 8s depart to deal with them.

Presently we had the good luck to meet not only the station commander, G/C. Rankin, but G/C. Thompson—S.A.S.O., No. 11 Group—and later (as he arrived by Anson) A.V-M. Patch, the A.O.C. himself. None of these gallant officers betrayed the least despondency, though trade was bad and the air marshal had just been obliged to deposit his Meteor at Waterbeach with a defective hood-seal.

In the course of a chat with S/L. Bennett, officer commanding a top-notch, Duxford-based Meteor squadron, we heard about a sortie flown that morning. As leader of four Mk 8s he had been told to make 36,000ft to oppose a target coming in from the Dutch islands. This materialized as four Sabres, and a smart turn and a tail chase ensued. The Meteors closed "on the Mach," got in a couple of "dead-duck line shots" apiece, and claimed the lot.

Duxford's own two-seaters being unavailable, our desire to experience a similarly satisfactory encounter was translated into the arrival of a Meteor 7 from a famous Auxiliary squadron; for which, our thanks to those who interceded—and complied.

F/O. Hodgson, the pilot, was briefed to fly as No. 2 to F/L. Spiers, leader of a section of four. Observing that the borrowed Meteor's ailerons were innocent of such fripperies as spring tabs, he deplored that power-assisted arms did not run in his family. For some urgent reason, of which we were not immediately aware, the tempo of our strapping-in was sharply stepped up from the polite to the unceremonious; then suddenly, half-dazed with hitchings, strappings, tightenings and slammings, we found ourselves hurtling down the runway and being swept aloft on a battle-climb to 30,000ft.

Through dark, dense cloud the stubby silver wing on our left nestled close in to the leader's olive-green Mk 8. We thrust up through the vapourous gloom, and at last burst into sun-flooded uplands of cloud, with glaring blue over all.

The Meteor 7 is still, to our own mind, the most exhilarating passenger-carrying vehicle extant; but it lacks pressurization and its heating arrangements are, to say the least, inequable. So while at the back the writer was comfortable enough, F/O. Hodgson (as he later told us) was "crocked" with cold, and was glad to level out at 28,000ft. His wrist-watch was frozen over.

We had been vectored on to a raid from the north, but this turned away just as we made our height, and our despondency was only assuaged by a battle scene, suddenly projected on to our field of view ahead. We saw glinting Meteors tearing in to a bunch of flashing Sabres and felt the urgent acceleration of our own machine to join in. But our speed being low at the top of a climb, we could not increase it sufficiently, and we "threw away" the chase to patrol north of Dunkirk.

The greatest height we noticed on the altimeter was 31,000ft and the highest Mach reading 0.69-0.7—at which figure our Meteor (which had seen better days) broke into a spirited weave in waltz-time. This proved highly diverting to our irreverent comrades, and could only be arrested by applying the dive brakes.

Though our section later had a call to deal with a raid building up some 80 miles south, and was told to make all height possible, our own fuel state, and F/O. Hodgson's understandable lack of enthusiasm for yet higher levels, determined him to break off the proceedings. We headed home over London at 26,000ft. Our capricious Waltzing Matilda was only persuaded to sit down on the runway by a final application of dive brakes. H. F. K.

From the "Enemy" Camp

COTTESMORE is a good example of the large and active light bomber station and the wing of Canberras at present based there are having a busy time during "Dividend." The squadrons involved expect to fly some 300 sorties during the period, and on some days crews will fly more than one sortie each.

Except that some aspects of briefing have been streamlined and quite a lot of the basic information can be issued in printed form, the preparations for a trip are as previously: the intention, the route, the load, the conditions, the other activities, friendly and hostile, which may have a bearing on the sortie. Then there are the weather, contrail heights, the method of return, let-down and landing, security warnings and time checks. The navigators, in fact, receive their special information first and are then joined by the pilot and bombardier for the general briefing. The task of giving the main briefings is shared between the Wingco Flying and the squadron commanders.

The Canberras have been making some long sorties covering large areas of Europe and the North Sea before coming in to attack targets in the British Isles. Simulated visual or GeeH bombing is usually ordered, but some live drops on Sandbanks and other ranges have been authorized.

Canberra crews are liking this exercise better than previous ones because they are being allowed to fly at full operational cruising speed instead of around Mach 0.7 or so as before. They are also being briefed to fly higher on the whole, and there is a chance of genuine interception which adds to the interest. Two Canberra crews actually spoke at de-briefing of having been overhauled from directly behind by two Swifts (with plenty of speed margin and manœuvring power). A total of four Swifts were reported seen in pairs by one crew. The height was around 40,000ft; their speed, it was said, must have been better than Mach 0.8, and the position was some thirty miles out over the North Sea as the Canberras came in. In fact, there were no Swifts flying at this time—next week-end, perhaps—but at these heights recognition is difficult and the aircraft may have been one of the other swept-wing types operating in the area—Sabres or Hunters.

This sort of interception is the best thing that has been mentioned by any Canberra crew since the type started to take part in exercises, and, incidentally, it emphasizes the real need that now exists for a tail-warning device. At the moment the crews have no rearward vision. Crews may be called on to demonstrate the high-altitude manœuvrability of the Canberra, evasive action having for the first time been authorized on daylight sorties.

At the time of our visit Cottesmore had been shot-up only once, and it is suspected that the Sabres concerned were from nearby North Luffenham. On another occasion Sabres were scrambled to chase the Canberras, but it seems they failed to catch them. Meteors on a standing patrol in the middle twenty-thousands jumped one Canberra while it climbed away from base. Another Canberra crew was somewhat surprised to be contacted by a lone Dutch Meteor "miles from anywhere at about 38,000 feet." A lone Vampire was also sighted.

During the week the squadrons had a re-arming exercise for which the aim was a very rapid turn-round. As soon as machines landed they were pounced on, refuelled, bombed-up and taken-off again in the shortest possible time. Some short-notice surprise operations were also expected at any time.

As the exercise proceeds it is probable that intruder activities, jamming, interference with Gee and all the other war-time harassments will be introduced. This will all add to the realism and value of the exercise. It would be a pity if the remark of one crew, just returned from a long sortie, applied on too many occasions. They said: "Nothing happened, and the first aircraft we saw after take-off was the one landing ahead of us on the runway." M. A. S.

HERE AND THERE

Saab J.29 Record Confirmed

THE F.A.I. has officially confirmed the 500 km (310 miles) closed-circuit world speed record of 976.916 km/hr (607.05 m.p.h.) set on May 6th by Capt. A. E. Westerlund with a standard Saab J.29 (Svenska Flygmotor/D.H. Ghost).

Hawker Siddeley Capital Issue

AT an extraordinary general meeting of the Hawker Siddeley Group, to be held in London on July 30th, power will be sought to increase the company's capital from £8m to £18m by the creation of 10m new Ordinary shares.

French Air Attaché's Farewell

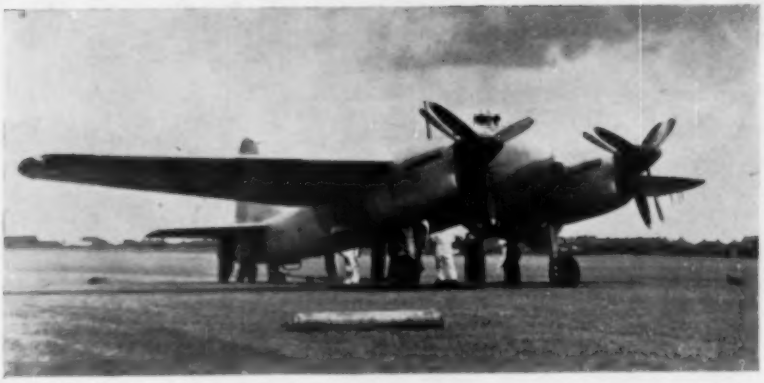
HIS many friends in this country were sorry to learn that Colonel de Rancourt will shortly be relinquishing his appointment as French Air Attaché in London. He is to take up an important posting with the Transport Command of the French Air Force. On Wednesday, July 14th, he gave a farewell cocktail party in Hans Crescent, London.

Canadair's New Research Lab.

AN altitude chamber for testing major items of equipment at simulated heights of up to 80,000ft is one of the features of a new laboratory block now being erected by Canadair, Ltd., at their Montreal works. A structural-test machine capable of imposing 400,000 lb tension and compression loads, and a rig for testing fuel systems under any required flying condition, are among other facilities to be installed.

Short Bros. Chairman's D.Sc.

AN honorary degree of Doctor of Science was conferred upon Rear Admiral M. S. Slattery, C.B., F.R.Ae.S. (chairman and managing director of Short Brothers and Harland, Ltd.) at Queen's University, Belfast, on July 18th. Introducing Rear Admiral Slattery, Professor A. H. Naylor (Dean of the Faculty of Applied Science and Technology) spoke of his "tremendous knowledge and appreciation of technical matters" and recalled his insistence on the adaptation, during the war, of the Vickers-Supermarine Spitfire for shipboard use as the Seafire.



SNUBBED, BUT USEFUL: The rebuilt version of the Short Sturgeon T.T.2 target tug (the first of nine is seen) no longer carries synchronized photographic equipment (and its operator) in the nose, which is consequently shortened by 6ft 9in. The hydraulic wing-fold has been replaced by manual mechanism, and R.A.T.O.G. and arrester hook removed. Total weight saving is 680 lb.

Messerschmitt Decorated

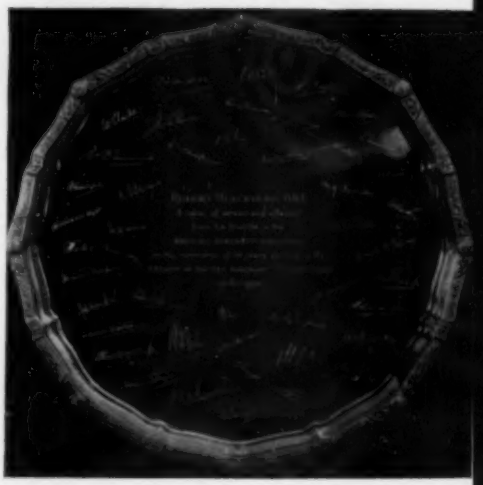
THE Spanish Air Ministry has decreed that the Grand Cross of the Order of Aeronautical Merit be conferred on Dr. Willy Messerschmitt for "outstanding services to the Spanish aviation industry."

For Safety at Sea

THOUGH primarily designed for Naval and Merchant Navy use, several of the liferafts, dinghies and other items demonstrated last week by the R.F.D. Co., Ltd., in King George V Dock, London, incorporated features well known in their aircraft safety-equipment. The demonstration was made from R.M.S. *Durban Castle* before a large audience of shipping executives.

Universal Urge

THE Blackburn and General Aircraft chairman's statement, published in advance of the annual general meeting on August 5th, says that nearly all the company's smaller contracts have recently been completed, and that labour has been transferred to work on Beverley transports for the R.A.F.: "I am most gratified by the speed and efficiency with which the production line is taking shape," says Mr. Blackburn. Speaking of man-power, he remarks that during the past two-and-a-half years the company's technical strength has been more than doubled—"a notable achievement during a time of great competition for technicians." The company's accounts show a net profit of £244,000, as against £176,000 in the previous year.



SILVER SALVER recently presented to Mr. Robert Blackburn (chairman of Blackburn and General Aircraft) by S.B.A.C. members, whose signatures are engraved upon it. The inscription refers to it as "a token of esteem from his friends" on the termination of his 38 years' service to the S.B.A.C.

BELFAST HONOUR: As recorded on this page, an honorary degree of Doctor of Science was recently conferred on Rear Admiral M. S. Slattery, chairman and managing director of Short Brothers and Harland, Ltd. In this photograph he is seen (left) in a Degree Day procession headed by Field Marshal Lord Alanbrooke, Chancellor of Queen's University, Belfast.

"Military Aircraft" Reprinted

IN spite of a much increased printing order, *Flight's* "Military Aircraft of the World" special number (June 25th) was sold out almost immediately it appeared. Arrangements have now been made for a reprint of the main 50-page review feature, complete with its 170-odd illustrations, the majority in photogravure. Copies should be obtainable at most good newsagents within the next few days at 2s 6d, or may be ordered from *Flight*, Dorset House, Stamford Street, London, S.E.1, at 2s 9d including postage.

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A line-up of Jaskolka sailplanes during the Polish competitions at Leszno. Nineteen machines of this type took part.

THE CURTAIN RAISED

—*on East-European Gliding: Poland's Latest Sailplane and the Organization Behind It*

LAST month, for the first time since before the war, a British team took part in the Communist-sponsored International Gliding Competitions, held on this occasion at Leszno, in Eastern Poland. Polish Jaskolka sailplanes were used by the British pilots, one of whom describes the main features of the machine in this article. He also gives his general impressions of the sport of gliding in Poland. The standard of flying in Eastern Europe proved to be of a high order, and the racing technique (all contests were either triangular or out-and-return races) and tactics were generally in advance of West-European practice. It is of interest that, on the last day of the contests, the second British pilot, Dan Smith, broke the British National speed record over the 100-km triangular course by almost 8 m.p.h., at an average speed of 37.07 m.p.h.

By CHARLES ELLIS

PERSONAL relations between British and Polish glider pilots appear to have originated in 1936 when a party from the London Gliding Club attended the Gliding School at Bezmiechowa, run by the Aero Club of Lwow. Further excursions to the same school continued each year, until interrupted by the outbreak of the Second World War.

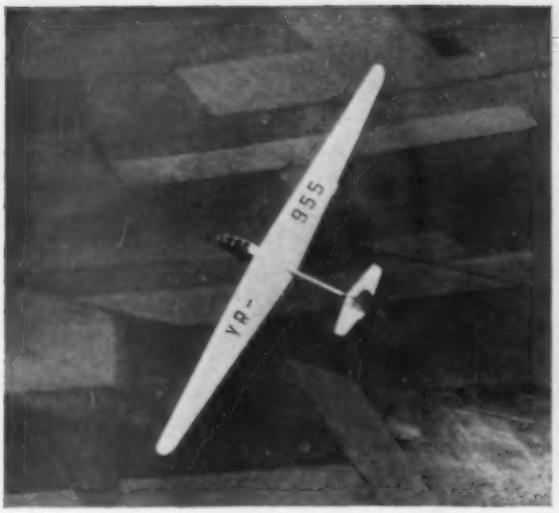
The opportunity for closer contact arose also at the Wasserkuppe during the first International Gliding Competition in 1937, when the splendid performance put up by their team, combined with reports brought back from Poland by the British visitors, left no doubt that Poland was in the front ranks of world gliding. Circumstances arising from the war prevented further visits, and only the briefest reports reached this country of Polish achievements—which served merely to increase our curiosity as to what was really happening. When, early this year, an official invitation reached the Royal Aero Club asking Great Britain to be represented at an international gliding meeting in Poland during June, the opportunity arose for both Dan Smith and myself to renew our old pre-war acquaintanceship with the Poles.

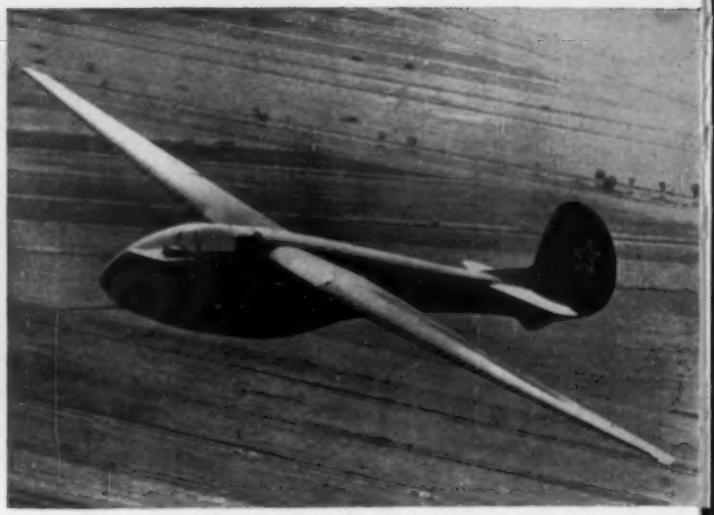
Visa difficulties having prevented a more direct approach, we travelled to Leszno (the scene of operations, some 50 miles south of Poznan) by way of Prague, arriving at our Polish destination in the early hours of Friday, June 11th. Daylight soon revealed that we were to take part in a very high-class gliding affair run by a top-flight organization.

In addition to ourselves, all the Polish competitors and the Bulgarians were flying the Jaskolka ("Swallow"), now in its first year of production, so a few words about it may be of interest. It is a shoulder-wing, fully cantilever machine of sixteen metres span and aspect ratio 18, with straight taper and the fashionable "spiv cut" tips. The tail unit is conventional except that the tailplane, like the mainplanes, has a marked degree of dihedral. The feature most interesting to a sailplane pilot is the wing flap, which is of the slotted variety, the hinge moving around a short sector to give a maximum deflection of 25 degrees. The flap handle permits the selection of an intermediate position of 12½ deg, but in practice it is possible to use almost any desired position, as the mechanism appears to be in balance at most normal flying speeds. With the exception of the flap, ailerons, rudder and elevator, all surfaces are plywood-covered. Another intriguing feature is the extensible single-wheel undercarriage. Used normally in a semi-retracted position (the axle then being flush with the bottom of the fuselage) for both landing and take-off, it may be extended by a hand lever and linking mechanism a further 10 inches. The advantage of this was not immediately apparent to one unfamiliar with Polish retrieving technique, but I was soon to have first-hand experience of it. The Poles have also put into practice a theory sometimes expounded here—that, using a half-buried wheel, it is not necessary to protect the entire length of the fuselage bottom from nose to wheel with a massive skid. In the Jaskolka a diminutive affair, neatly faired, extends for less than two feet immediately below the nose.

One of the first things that impress a pilot upon entering

(Left) The British team at the Leszno contests: (left to right) the author, team captain A. C. Hennessy, and Dan Smith. (Right) Winner of the contests, the Polish pilot Edward Makula, with the French woman champion Mme. Choisnet-Gohard and veteran Russian pilot Wiktor Ilczenko (national champion.)



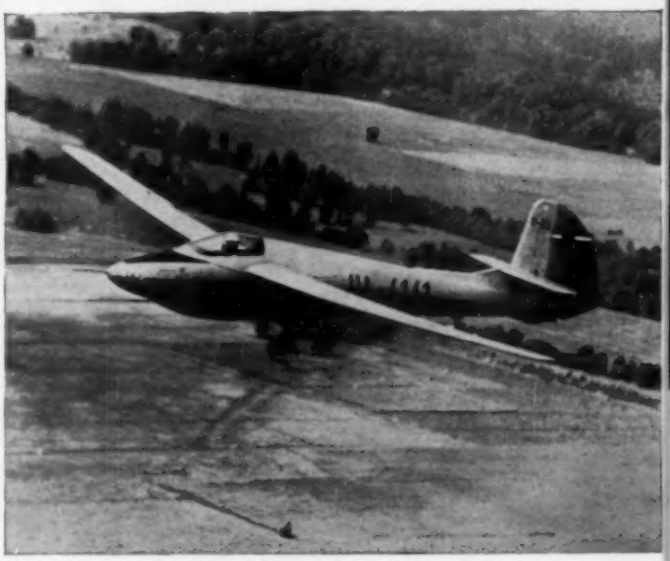


(Left) A plan view of the Rumanian IS-5. (Right) The Russian A.9, referred to by the Poles as "the fighter," because of its exceptional performance at relatively high speeds. (Below) The Hungarian Junius 18.

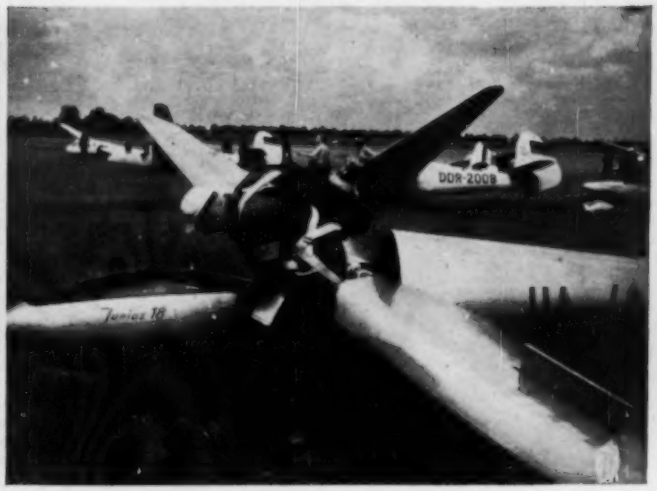
THE CURTAIN RAISED . . .

the cockpit is the first-class view, especially above and behind. This is largely a product of the shoulder-wing layout, but to one brought up on high-wing designs the difference is a revelation —and must add in no small way to one's performance when circling in close company with other machines. Although a small cross-sectional area was one of the designer's aims, the cockpit can comfortably house a six-footer of ample proportions; but he is encouraged to adopt a semi-reclining attitude with the aid of the adjustable rudder pedals and adjustable back-rest. The ability to thrust an arm up the wing-roots whilst in flight I found rather fascinating. The layout also provided ample stowage room for all those things your soaring pilot needs, or thinks he might need, on a cross-country. (The incessant tinkle of glass against glass which seemed to accompany most of my Polish flights was just bad organization on my part).

The handling qualities of the Jaskolka make it a joy to fly, the high rate of roll and very positive action of the ailerons being particularly rewarding and the rudder ample for all normal manœuvres. By popular British standards the elevator appeared sensitive, but it gave results in keeping with the high standard of precision flying demanded by Polish pilots. It seems that the Poles do not subscribe to the current requirement here, which is to ensure that even high-performance sailplanes can be flown safely by pilots of limited experience and mediocre ability. Under



(Below, left) This take-off picture shows a Jaskolka being aero-towed behind a PO-2. (Below, right) The finishing line: Each day's task consisted of a race (100 km triangular, 300 km triangular or 180 km. out-and-return), starting and finishing across this line. Here a Jaskolka of the Polish team completes the course at speed.



(Above, left) The Hungarian Super Fergeteg, with pilot Karsay in the cockpit. (Above, right) Runner-up in the individual championships, Gyorgy Mezo (of Hungary) prepares to fly the Junius 18. (Right) Anglo-Russian conviviality at Leszno: to the right of Charles Ellis (in check shirt) is Alexander Yrkevich, Ukranian designer of the flapping-wing "Koshuk" glider which flew during last month's Soviet Air Day celebrations at Tushino Airport, Moscow.

the Polish system, of course, there is absolutely no likelihood of a Jaskolka getting into incompetent hands. As regards performance, the minimum sinking speed is approximately 0.75 m/sec at 70 km/hr, and the maximum gliding ratio is 1 : 28 at 80 km/hr. Mr. T. Kostia, the designer, pointed out that a high gliding-ratio had not been the prime consideration. His chief aim was to obtain a performance curve flatter than most, as modern soaring technique does not demand a high gliding-ratio except for the final glide, whereas speed between thermals is all-important.

The appearance of the Jaskolka can be seen in the accompanying photographs, which show also a number of the other competing aircraft and pilots. The countries taking part in the contests were Poland, Eastern Germany, Czechoslovakia, U.S.S.R., Rumania, Hungary, Bulgaria, France and Great Britain.

Poland's gliding organization, being common to other East European countries, is worth noting. We first became aware of the philosophy behind it upon entering the reception hall at Prague Airport. "Leisure," a large and quite attractive poster informed us, "is the Right of Every Working Man." Once that has been accepted as part of the creed, it is only natural that there should be a government department to look after leisure. In Poland this is the Department of Culture and Sport, which is responsible for policy and finance in regard to all gliding matters. The Polish Aero Club is the part of this department responsible for operational and regional affairs, every town of any size having its gliding club. As a result, anybody in Poland can join such a club for a purely nominal subscription and enjoy first-class theoretical and practical instruction from a highly competent staff.

Whilst we were frequently told of the advantages of this system (under which "everybody can fly") as compared with our own methods, we soon discovered that the removal of financial barriers does not necessarily open up a sport like gliding to one and all. There is a pretty stiff medical which would "plough" many of the pilots in British clubs and, although there are extremely well-run classes to give technical gliding knowledge to boys of 14 to 16 who have not had the benefits of a higher education, it is clear that an above-average I.Q. is a requirement, as well as a near-perfect physique, for anyone wishing to pursue gliding as his chosen sport. Poland never was a rich country, and the war devastation which still remains to be healed commands the highest efforts from the whole community. It is not surprising, therefore, that she is not prepared to squander her limited resources upon those least suited to benefit from them.

Discipline, which is non-existent at British clubs, is not very evident in Poland either. There is not the faintest similarity in this respect to Hitler's N.S.F.K., and yet everything appears to run smoothly and efficiently without over-organization. Maybe it is because a youngster, having been accepted by a gliding club for training, realizes he has been elected to a *corps d'élite* and fears nothing so much as being thrown out. (In which event his flying days are over—there is nowhere else for him to go!)

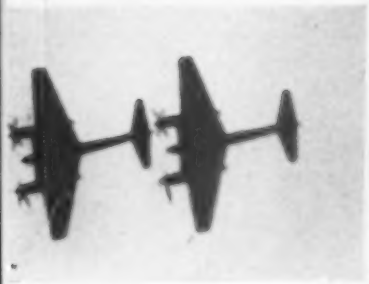
What I saw has convinced me that in her gliding movement Poland is getting excellent "value for money" (a capitalist phrase which will annoy at least one of my Polish friends, but I can think of none better) and I am certain that the reason for this is that the Polish Government has had the good sense to place the control of the sport in the hands of experienced soaring pilots, and has permitted them to develop the sport with the least possible interference.

The standard of flying and soaring seen during our stay was impressive. Apart from one collision in cloud, no damage occurred to any of the 36 competitors and ten tugs taking part throughout two weeks of most intensive competition flying. Admittedly the country was not difficult for forced landings, being without stone walls, hedges or substantial fences, and was extremely flat, though of course highly cultivated. The most hazardous operations were undoubtedly the air-retrieves from unbelievable situations, calling for the type of airmanship so seldom exploited these days. This is where the extensible wheel of the Jaskolka came in. Extended, it facilitated manœuvring the aircraft, by peasant-power, through thickly growing crops and enabled the fully extended flap to be used to advantage for quick take-off from rough ground. With the aid of an ancient ex-Russian PO-2 biplane with 125 h.p. engine, I was hauled out of a field (heavily spread with "muck") only 180 metres long, and this in a dead calm. The length of the tow-line, incidentally, was 20 metres.

Statistics, it is said, can prove anything; but if we accept the F.A.I. "Silver C" as an indication of a qualified soaring pilot we find that on a quantitative basis the only country to excel Poland is, not surprisingly, France. Like Poland, France has, if not a "free-for-all," at least a "free-for-the-under-21s" gliding movement run by the Government. Taking into account the larger population and the much larger technical and industrial facilities available, however, it is unlikely that the French movement can claim to be superior.

SCOTTISH VARIETY

An Air Day Visit to the Fleet Air Arm at Lossiemouth



MANY of the visitors to R.N.A.S. Lossiemouth (H.M.S. *Fulmar*) on Air Day, July 10th, had made long rail or road journeys to this important Fleet Air Arm station. So much was evident from the size of the crowd, considered in relation to the isolated nature of the district. We ourselves travelled well over 400 miles to watch the display, but since we were lucky enough to be given a ride on a Meteor trainer flying between Ford and "Lossie," the journey was no hardship. With Lt. Jude of the Royal Australian Navy at the controls, the trip took little longer than the coach ride between London Airport and Waterloo.

On arrival, we spent just long enough in the circuit to notice that the station is set in pleasant, pastoral surroundings about a mile from the Moray Firth. Downwind, our attention was divided between Gordonstoun—where H.R.H. the Duke of Edinburgh was at school—and a stream of seven Sea Hawks settling on the 9,000ft main runway. In addition to being the centre of Naval fighter training, Lossiemouth has quite recently become the base for two Sea Hawk squadrons—Nos. 804 (Cdr. E. M. Brown, O.B.E., D.S.C., A.F.C., M.A.) and 802 (Lt-Cdr. D. M. Steer).

Both squadrons' pilots are extremely pleased with their new aircraft, particularly from the viewpoints of speed and range. Official performance figures are still restricted, but we saw a placard in the static exhibition crediting this slim, sleek fighter with a top speed of 650 kt (which is perhaps optimistic), landing speed of 105 kt, and fuel tankage of 573 gallons, giving a range of 1,000 miles. With or without powered ailerons—both versions are in service at Lossiemouth—the Sea Hawk is reported to handle extremely well: one pilot described it as "an old gentleman's aeroplane," and another said that the first familiarization flight leaves an impression of 100 hours' type-experience, so well arranged is the cockpit layout.

With the exception of the Wyvern, Gannet and Sea Venom, most types of Naval aeroplane are operated or stored at Lossiemouth. The accent, however, is on fighters, for it is here that all the Navy's fighter pilots receive their pre-squadron training. On completion of their basic course with the R.A.F. at Syerston, students are posted to No. 749 Squadron (Lt-Cdr. D. R. O. Price, D.F.C.), whose equipment includes the first Vampire Trainers —T22s—to enter Naval service. This unit also provides jet conversion courses for pilots experienced on piston-engined fighters.

The next stage, before posting to a front-line squadron, is a course of advanced training, including combat, gunnery and deck landing, in the Meteors and Attackers of No. 736 Squadron (Lt-Cdr. A. R. Rawbone, A.F.C.). The importance of this squadron's rôle is underlined by the news that its Attackers are about to be replaced by the latest mark of Sea Hawk fighter-bomber.

Another Lossiemouth squadron, No. 738 (Lt-Cdr. J. Robertson) is occupied largely with converting American-trained pilots to "the British way of life." In addition to acquainting students with unfamiliar cockpit layouts, engines, terminology and procedures, the squadron provides them with operational training to fit them for carrier service. These tasks it accomplishes with Sea Furies, Vampire Trainers and Sea Hawks. No. 738 also operates the Navy's only instrument flying school.

"Flight" photographs

A Neptune from nearby Kinloss arrives for a demonstration of its reverse-pitch airscrews. The two Sea Hornets (above, left) are performing a formation roll on one Merlin apiece—an effective manœuvre calling for very precise handling of engines and airframes.

In addition to the varied equipment of the resident squadrons, Lossiemouth has its own communications aircraft, two Meteors for target towing, and three Dragonfly helicopters. Although their primary rôle is search and rescue, the "choppers" are kept permanently busy with all kinds of unexpected duties. In the static exhibition we saw one Dragonfly with a placard recording its work in the Dutch floods: "192 victims saved." Just before the display began the other two appeared over the airfield, one carrying Vice-Admiral The Mackintosh of Mackintosh, its escort flying a large white ensign. An impressive figure with kilt, plaid, bonnet and cromach, the Vice-Admiral mounted a rostrum and declared the Air Day open.

The first act was a simulated dog-fight by four Vampire 22s of No. 759 Squadron, emphasizing the manœuvrability of these versatile trainers. Next a vigorous performance from five 736 Squadron Attackers, which may soon be transferred to the R.N.V.R. There was an impressive climax to this polished, well-timed aerobatic act: two Attackers landed in opposite directions on the long runway, two more landed together downwind and, as they pulled up at the intersection with wings folded, the leader touched down between them.

Peter Rayner then jumped—from a Dragonfly—to add one more parachute descent to his total of 200-odd, setting off again soon afterwards by Vampire Trainer on the first stage of a journey to France, where he took part in the World Parachuting Championships.

Possibly because of its split jet-pipe arrangement, the Sea Hawk

"Flight" photograph

Lossiemouth's Air Day was formally opened by Vice-Admiral The Mackintosh of Mackintosh, C.B., D.S.O., D.S.C., D.L. This view from the tower shows the opening ceremony and (background) the static park, which included the Hellcat used as a personal "hack" by Capt. J. A. Ievers, O.B.E., Commanding Officer at Lossiemouth.

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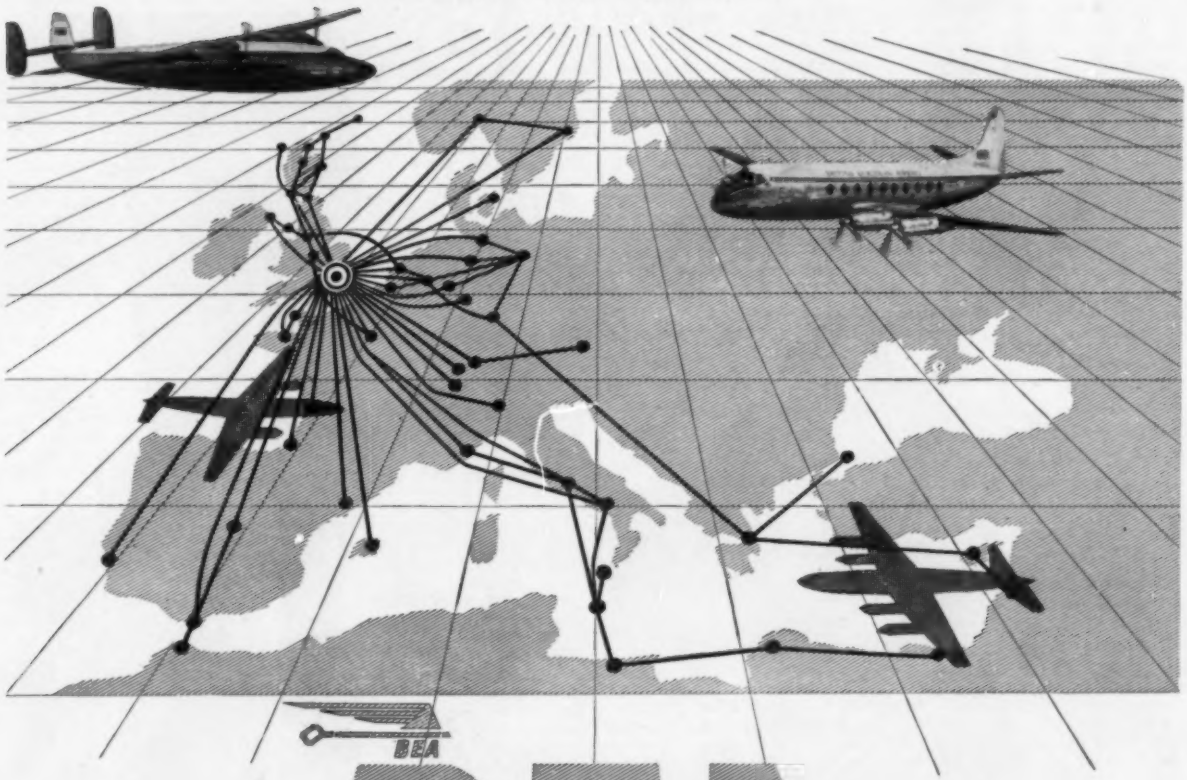

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In unison: a box landing by four Sea Hawks of No. 804 Squadron. Their formation flying was enhanced by streams of smoke generated in hook-mounted canisters.

SCOTTISH VARIETY . . .

is far less noisy than the majority of jet fighters. A low, very fast run by Lt-Cdr. Steer succeeded in taking the crowd by surprise without causing the usual ripple of frightened laughter. His repertoire included a Derry turn, a loop bisected by the cloud layer and an inverted entry into the landing circuit—letting the wheels up instead of down. Flown by Lts. Taylor and Dixon, Dragonfly helicopters neatly filled in every gap in the flying programme. Their antics included the "flying bicycle" and "magic carpet," terms imported from the previous Saturday's Air Day at Ford, but none the less enjoyable for that.

Not far from Lossiemouth is the Coastal Command base at Kinloss, and the Navy was anxious that the R.A.F. should take part in the flying display: so anxious, we gathered, that an invitation was discovered one morning on the Kinloss parade ground, written boldly in whitewash. During the night before the display, various precautions were taken in case Lossie's neighbours, arriving early, should not receive a proper reception. But such things as trip-wires were laid in vain, for in fact the R.A.F. arrived precisely on schedule, manning a stately formation of four Neptunes, without a single can of whitewash between them. As illustrated on the previous page, one of the formation landed, politely demonstrated its reversing airscrews, and set off again for Kinloss.

A red letter "X" on a black canvas frame marked the spot chosen by eight Sea Fury pilots of 738 Squadron for a display of bombing and rocketing. Four single-seat Mk 11s attacked first with R.P.s, leaving only a cloud of smoke and debris for the quartet of trainers which were to follow up with 25-lb bombs. Powerless flight was demonstrated by two members of the Fulmar Gliding Club, Lt. Crofts (Grunan) and C.P.O. Holder (Slingsby T.21). Although *Fulmar's* surrounding district is sparsely populated, the station receives its share of complaints about jet noise. Lt-Cdr. Price included a tactful apology in his commentary during this event.

A distant line of hills, hazy purple against a golden cloudscape, made a fine setting for seven Sea Hawks of No. 804 Squadron, until recently equipped with Sea Furies. Although self-converted to jets, the Squadron's proficiency in handling the new aircraft is already marked. Their performance included a formation loop by all seven Sea Hawks and a "bomb-burst" by four aircraft, which rejoined for a slow circuit with everything down (including hooks) before landing in box formation. Individual aerobatics, ancient and modern, were performed by a Meteor 7 and a balloon-bursting Tiger Moth, piloted by Lts. J. R. Haward and M. Tibby. Lt. Haward kept his speed below 300 m.p.h. throughout a very smooth and stylish demonstration, with the Meteor in full view at all times. For good measure, the R.A.F. provided an agile but non-aerobatic Canberra—whose take-off, incidentally, put to shame the smaller and lighter jets' efforts.

Before the final event—a mass fly-past by 27 Sea Hawks, nine Vampires and nine Attackers—came a magnificent demonstration by three Sea Hornets, billed as "the fastest piston aircraft in the world," and withdrawn from storage to take part in the display. Lt-Cdr. Ian Martin, now senior pilot of No. 802 Squadron, repeated the act which he devised for the Naval aerobatic tour of America six years ago—a feathered loop. Both airscrews are stopped during a steep dive with both Merlins at full power. Speed drops from 390 to 320 kt, producing a strong nose-down tendency. With both hands on the stick, the pilot heaves the Hornet into a loop. The effect is most dramatic, both visually and aurally, for it provides a reminder of the airframe's contribution to aircraft noise. Lt-Cdr. Martin's unpowered Hornet sounded not unlike a throttled-back Vampire. His companions took off from opposite ends of the runway for an equally thrilling performance, concluded by a roll in tight formation on one Merlin apiece.

H. K. JONES

IT is with regret that we record the death of Mr. H. K. Jones on July 6th at Durban in South Africa, where he went to live when he retired from the aircraft industry at the end of the war. At the zenith of his career he was managing director of Hawker Aircraft, Ltd., Gloster Aircraft Co., Ltd., Armstrong Siddeley Motors, Ltd., Sir W. G. Armstrong Whitworth Aircraft, Ltd., Air Service Training, Ltd., and Armstrong Siddeley Development Co., Ltd., and was also a director of Hawker Siddeley Aircraft, Ltd., and of A. V. Roe and Co., Ltd.

"H. K."

"H. K.," as he was always known to his friends, will be remembered as one of the quite remarkable team who in the late twenties and early thirties built up the fortunes of the Hawker Engineering Co., Ltd.—successors to the Sopwith Aviation Co., Ltd., and forerunners of the Hawker Aircraft Co., Ltd., and ultimately the great Hawker Siddeley Group.

He had a tremendous capacity for work; at one time, in the early days, he combined the tasks of chief buyer, foreign salesman and business manager on the works side. Despite his many preoccupations he never seemed overwhelmed and seemed always to have sufficient time to greet a friend. A true picture of him would show him in shirt sleeves at his desk, and his "coat off" attitude to life was as true of him when he was on the boards of nearly a dozen companies as it was when Hawkers were making a precarious living from a small output of motor cycles. One of his happiest times came in 1926 at the Lympne Lightplane Trials where he managed the team in which "George" Bulman won the premier award on the little Hawker Cygnet.

J. Y.

G/C. C. M. M. GRECE

WE are also sorry to learn of the death of G/C. C. M. M. Grece, D.F.C., in a flying accident on July 12th at Eastleigh airport, Southampton. His wife and her uncle, Mr. H. Harman, who were with him in the aircraft, also lost their lives. The party was returning to Middle Wallop after taking part in the La Baule rally.

G/C. Grece, who was 40 years of age, was educated at Dover College and Wadham College, Oxford. After obtaining a law degree he became a solicitor in 1938; a member of the R.A.F.V.R., he took a permanent commission in 1939. He commanded No. 39 Army Co-operation Squadron in France before Dunkirk and then took part in the Battle of Britain. He later flew with Coastal Command over the Channel and in the Mediterranean and Middle East theatres of war. At the end of the war he passed through the R.A.F. Staff College in Palestine and was Air Attaché in Rome until 1947. He later commanded successively Wattisham, Felixstowe and Middle Wallop and was, at the time of his death, due to take a two-year course at the American Air Force University in Alabama. While commanding Middle Wallop he founded the Wallop Aero Club.

He was well known for his civil flying activities in a Miles Nighthawk, which he flew in several air races and rallies, both in England and abroad. He was second in the recent Welsh Air Derby. Shortly afterwards he sold the Nighthawk and purchased the aircraft—a Vega Gull, G-AFBC—in which he lost his life. The funeral took place last Monday, July 19th.

G.A.P.A.N. MEETS M.P.s

THE Court of the Guild of Air Pilots and Air Navigators held a reception at Londonderry House on Tuesday of last week with the object of introducing Members of both Houses of Parliament to the Guild's newly formed parliamentary committee. The Master, Capt. J. C. Harrington, welcomed the guests and outlined briefly the aims and objects of the new committee, emphasizing its non-political nature. Among the guests were the Minister of Transport and Civil Aviation, Mr. A. T. Lennox-Boyd, his Parliamentary Secretary, Mr. J. Profumo, and Members of both Houses.

The P.R.7's intensive flying trials kept ground crews on shift work both by day and night; even the traditional holidays of Whitsun and the Queen's Birthday were sacrificed. Here, big reconnaissance cameras are being loaded on July 6th.

P.R.7 AT WORK

ALL new types of aircraft for the R.A.F. have to undergo what are known as intensive flying trials—a procedure intended to uncover every snag and reveal every deficiency in the new machine under representative operational conditions. In the course of such trials many notable aircraft (and engine) performances have been established; but the test of the English Electric Canberra P.R.7, completed on July 6th, has beaten all.

The P.R.7 is, at 66ft 9in, longer than earlier marks, and operates at greater all-up weight, necessitating bigger wheels and tyres. The Rolls-Royce Avons are also of a new type, giving considerably more thrust than do those of the B.2 bomber.

The machine selected was WH 796, of No. 542 Squadron (S/L. A. J. Picknett, D.F.C.). The objects were to obtain general performance data—cruise-control techniques, for example—and to test the behaviour of the photographic equipment and, especially, the power plants, which were to be returned to Derby for stripping at the end of the trial. Four crews were detailed (pilots, S/L. Picknett, and F/L.s D. J. Carruthers, A. J. A. Heyns and T. W. Oakey, A.F.C.), working continuous shifts, with 24 hours off after three shifts. Flying began on June 12th, the target being 300 hr in 30 days.

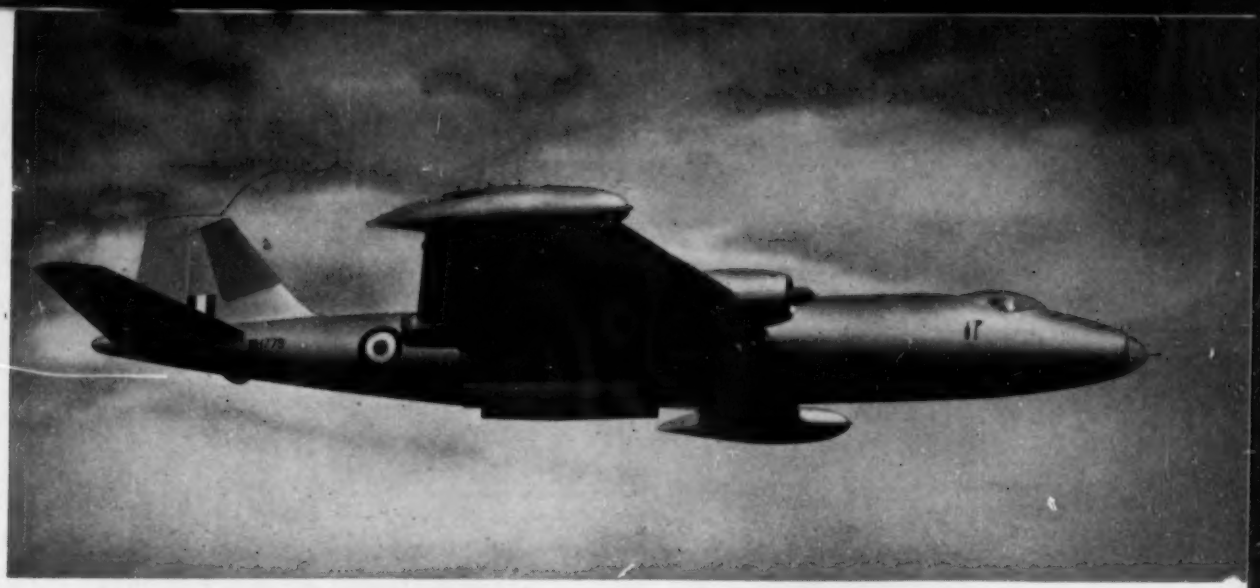
WH 796 was in the air seven days a week; on one day, June 23rd, 18½ hr were logged. On each trip, the P.R.7 was taken to well over 40,000ft—the lowest outside air temperature recorded was −67 deg C—and circuits were flown round the United Kingdom, *via* Kinloss, St. Eval and Manston. By July 6th (25 days) the 300 hours were up, and the air mileage stood at some 156,000.

The Avons were stripped, and found to be in such good condition that the trial has now been extended. Throughout, WH 796 received only routine inspections; no "major" was undergone, no troubles of any consequence were encountered, and no replacements were required.

One of the four crews was F/L. A. J. A. Heyns (on the right) of the Orange Free State, seen with his navigator, F/O. R. J. Toseland of Kettering.

Below, servicing teams swarm over WH 796 on July 6th, shortly before it completed the 300th hour. Fuel is going into the fuselage tanks.

More activity, including a new cartridge for the starboard B.T.H. triple-breech starter. The fuselage camera and equipment doors are open.



This is WH 779, another of 542 Squadron's P.R.7s, with the main camera doors open.

This striking photograph—taken, as were the others, by an Air Ministry photographer—shows WH 779 pulling up into a steep climb at 30,000ft. The intensive flying of WH 796 was largely at a higher altitude and crews often found no evidence of any other aircraft, especially in the early morning. The ground was seldom visible and, owing to perpetual twilight in the North, the crews had the sensation of being in continuous daylight.

AIRCRAFT INTELLIGENCE

THE SPY IN BLACK: Photographed during the American Armed Forces Day celebrations, this Martin RB-57A Canberra belongs to the 363rd tactical reconnaissance wing. Finish is glossy black, with red stencilled instructions and serial. The engines are Buick-built Sapphires.

Great Britain

Folland Fighters. It is reported in America that "First prototypes of Folland Aircraft's lightweight fighter will be called the Midge instead of the Gnat, because the initial models will not have installed the ultimate powerplant—Bristol's Orpheus turbojet of 5,000 lb thrust."

United States

Bell HSL-1. Elsewhere in this issue (p. 110) is an account of R.A.F. intensive flying trials. The American equivalent of such tests is now being applied to the first of six Bell HSL-1 anti-submarine helicopters (*Flight*, June 4th last) at the Naval Air Test Center. The 1,465-mile flight to Patuxent River from the helicopter factory at Fort Worth was made in some 17 hr flight time. A recent report states that the HSL-1 carries the Fairchild Petrel rocket-propelled guided air/underwater missile. Dunking sonar equipment was illustrated in our last week's issue.

Cessna CH-1. Under this designation, Cessna's helicopter division are developing a four-passenger machine. C.A.A. certification is said to be in view, and final tests are scheduled for completion by autumn. No details are available, but the design possibly owes something to the Siebel Sky Hawk, the most advanced product of the company which was taken over to form Cessna's helicopter division.

Douglas X-3. An Italian report avers that this supersonic research aircraft is partially cooled by circulation of fuel through the structure; in particular, the wing leading-edge is thermally isolated by this means, which would seem to obviate any possibility of ice accretion, to say the least. There is also, of course, a high-capacity water-cooled refrigeration system (*Flight*, February 26th, 1954).

Grumman S2F. This twin-piston-engined search/strike anti-submarine aircraft is now appearing in fair numbers. One recently made the first piloted take-off from a steam catapult on an American carrier (U.S.S. *Hancock*). Another was damaged in a wheels-up landing at Quonset Point, following jamming of the port wheel. Although not officially named, the S2F has been linked with two names: "Sub-Killer" and "Sentinel."

McDonnell Banshee. This week's three-view drawing shows the latest type of Banshee single-seat fighter of U.S. Navy carrier squadrons, the radar-directed F2H-4. A recent modification is the increased tailplane area. Production of Banshees ceased this year, with over 800 delivered.

France

Nord 2501 Noratlas. On June 25th, at Bourges, the president of S.N.C.A.N., M. Jacques Piette, handed over the 34th Noratlas to Gen. Fay, chief of staff of the *Armée de l'Air*. The Nortalas is a large twin-boom transport, powered by two Hercules. Some are being flown to Indo-China, and M. Piette emphasized the speed with which these aircraft were being built, with the assistance of Breguet.

Nord 3201. As yet unnamed, this Chipmunk-like military trainer first flew at the end of June. Powered by a 170 h.p. SNECMA inverted four-in-line engine, it weighs 2,000 lb loaded and has an aerobatic strength factor of no less than 13. A second machine, powered by a 240 h.p. Argus, will fly in two months.

S.N.C.A.S.E. Harpon. This appears to be regarded as one of the most promising of all new French designs, and development is being hurried forward. It is to be a highly supersonic single-seat fighter, and four-tenths scale models, powered by S.E.P.R. rocket motors, are being air-launched over North Africa, to assist in the development of the Harpon's aerodynamic configuration and control system. There has been no further news of the Durandal supersonic fighter since S.N.C.A.S.E. exhibited a model last year.

McDONNELL F2H-4 BANSHEE
(Two Westinghouse J34-WE-34 or 38 turbojets)

Span	...	...	...	...	44ft 11in
Length	...	...	...	...	47ft 6in

Air Power at Sea

H.M.S. ILLUSTRIOUS

The first ship to bear the name *Illustrious* was a 74-gun third-rate. Many of the famous 74's were originally three-deck ships but had the top deck removed and hence were known by the French term "Razees". They served the Navy in the eighteenth century. The fleet carrier *Illustrious* of 23,000 tons, her modern successor, is the fourth ship of that name. Armed with her striking force of naval aircraft, she upheld the highest traditions of the Royal Navy in battle after battle between 1939 and 1945. Operating from the oceans of the world, shipborne Fairey aircraft in *Illustrious* brought many combat successes to her long list of "Battle Honours".

In this great tradition Fairey Gannet anti-submarine aircraft are equipping front-line squadrons of the Fleet Air Arm.

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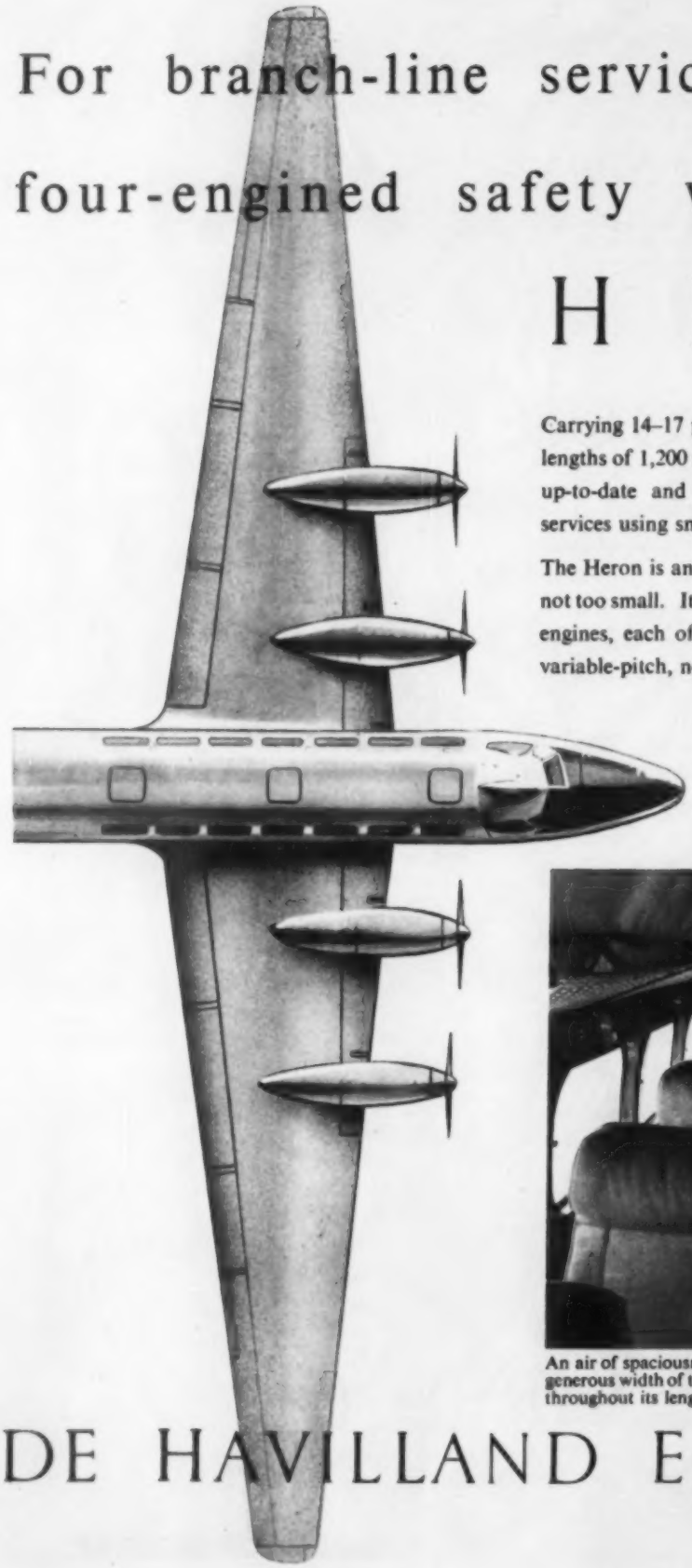
HERON

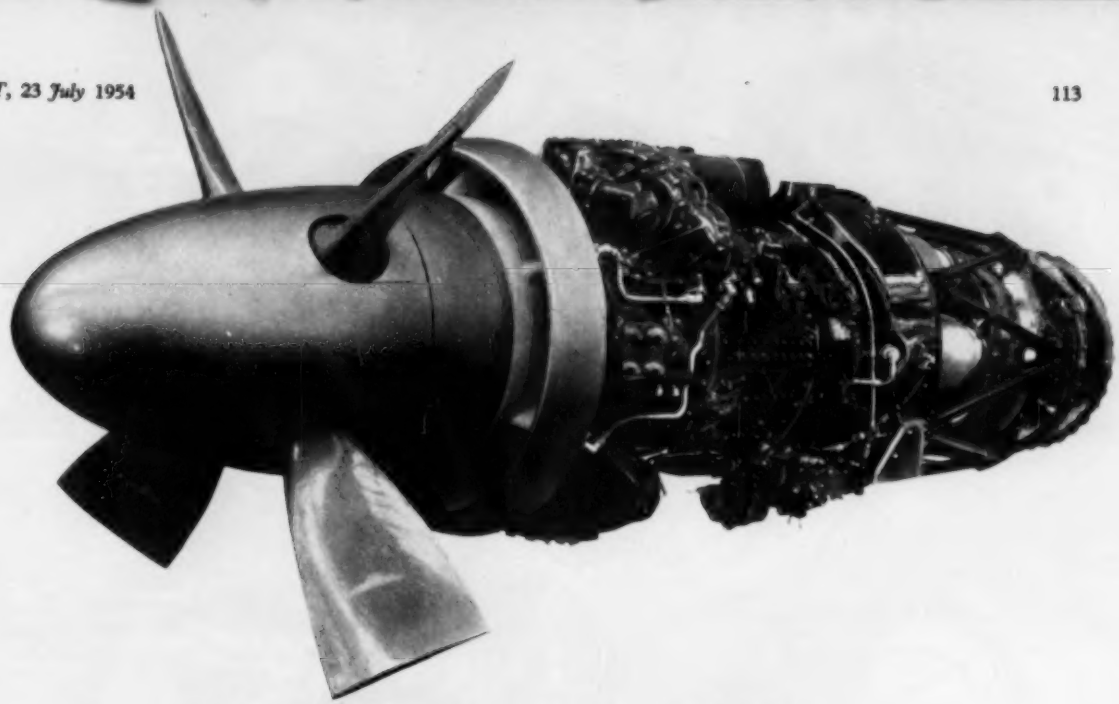


Carrying 14–17 passengers, their baggage and freight on stage lengths of 1,200 statute miles, the de Havilland Heron provides up-to-date and most economical transport on branch-line services using small airfields.

The Heron is an efficient and elegant aircraft, not too big and not too small. It has four de Havilland Gipsy Queen 30 Mark 2 engines, each of 250 b.h.p., driving de Havilland two-blade, variable-pitch, non-feathering propellers.

An air of spaciousness is created by the unusually large windows and the generous width of the gangway. The cabin has a head-room of 5 ft. 8¼ in. throughout its length.

DE HAVILLAND ENTERPRISE



NAPIER ELAND

A NEW TURBOPROP FOR FIXED- AND ROTARY-WING APPLICATIONS

SINCE the end of World War II the firm of D. Napier and Son, Ltd., of London, W.3, has been rather less prominent in the aircraft world than it was after the first Great War. This fact has been brought about not by any lessening of the company's interests in air affairs but by their insistence upon concentrating all their energies upon the development of highly competitive engines of the compound or gas-turbine type for service in the latter half of the present decade. Although one of the present basic aeronautical aims of the company cannot yet be disclosed, it can be said that, by sheer engineering ability, they have every chance of re-establishing their pre-war position as one of the world's principal sources of advanced types of aero engine.

One of the foundations in the company's planning is the Eland turboprop. Although not a particularly remarkable engine when glanced at casually, it is, in fact, the result of detailed design of exceptionally high quality. In the writer's opinion, this unit affords a perfect object-lesson in the development of the modern aero engine.

The history of the Eland really began in the immediate post-war period when Mr. A. J. Penn, chief engineer of the company's gas turbine division, planned a gas-turbine-research station which, by European standards, has quite exceptional capacity; it is now in full operation, with 40,000 installed horse-power. In 1946 the company took their first bite at the new gas-turbine apple with a 1,500 h.p. turboprop named the Naiad. With this engine the company gained a most extensive and valuable grounding in knowledge of axial compressors. Even though the Naiad never went into production its compressor has since been greatly developed for the Nomad (*Flight*, May 30th last); in passing, it may be noted that the company have obtained pressure ratios as high as 15 : 1 from single-shaft units.

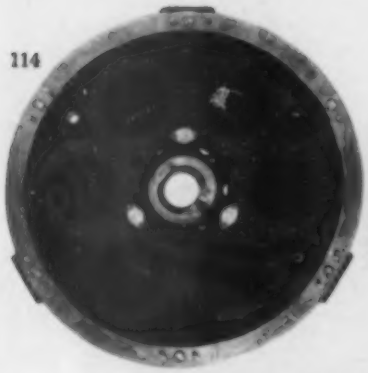
By the end of 1950 Napiers had a very good idea of what form a competitive future turboprop ought to take and a larger single-shaft engine was planned as a private venture under the company designation E.141. The firm seem to be blessed with several engineers who are able to see both the wood and the trees—that is, men who can design a power-plant not only capable of setting a competitive level of efficiency but which is also closely tailored to the requirements of the customer from every secondary viewpoint as well.

The basic form of the Eland (as the E.141 has become known) is itself an example of how an engine ought to be planned. In effect, Napiers asked the airscrew manufacturers what was the minimum size of spinner required for a 16ft airscrew absorbing 3,500 s.h.p. This, at least, can probably be considered as one factor which is quite out of the engine designer's hands. Having received the appropriate information, which was the governing factor in the initial design of the engine, they made a dummy spinner and tunnel-tested it with an annular intake designed to pass the required mass flow of 31 lb/sec. Eventually the company reached the correct intake lip shape and spill ratio and were then able to work up a minimum-drag cowling.

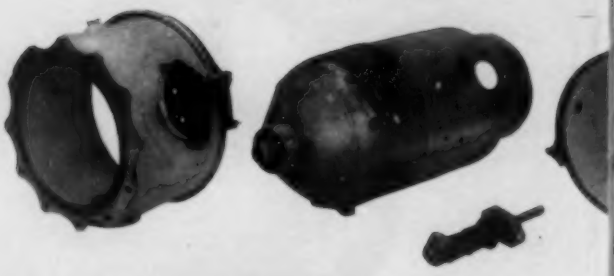
Meanwhile, the space behind the spinner virtually decided the reduction-gear ratio and, therefore, the r.p.m. The compressor was then planned, using a fairly high hub/tip ratio, and the rest of the layout appears to have fallen quite naturally into place. A fundamental feature of the design is that the turbine assembly is supported by external tubes attached to the main centre support ring. Furthermore, as described hereafter, the engine is divided into four main sections—reduction gear, compressor, combustion chambers and turbine—each of which can be removed and replaced individually without disturbing any other part of the engine.

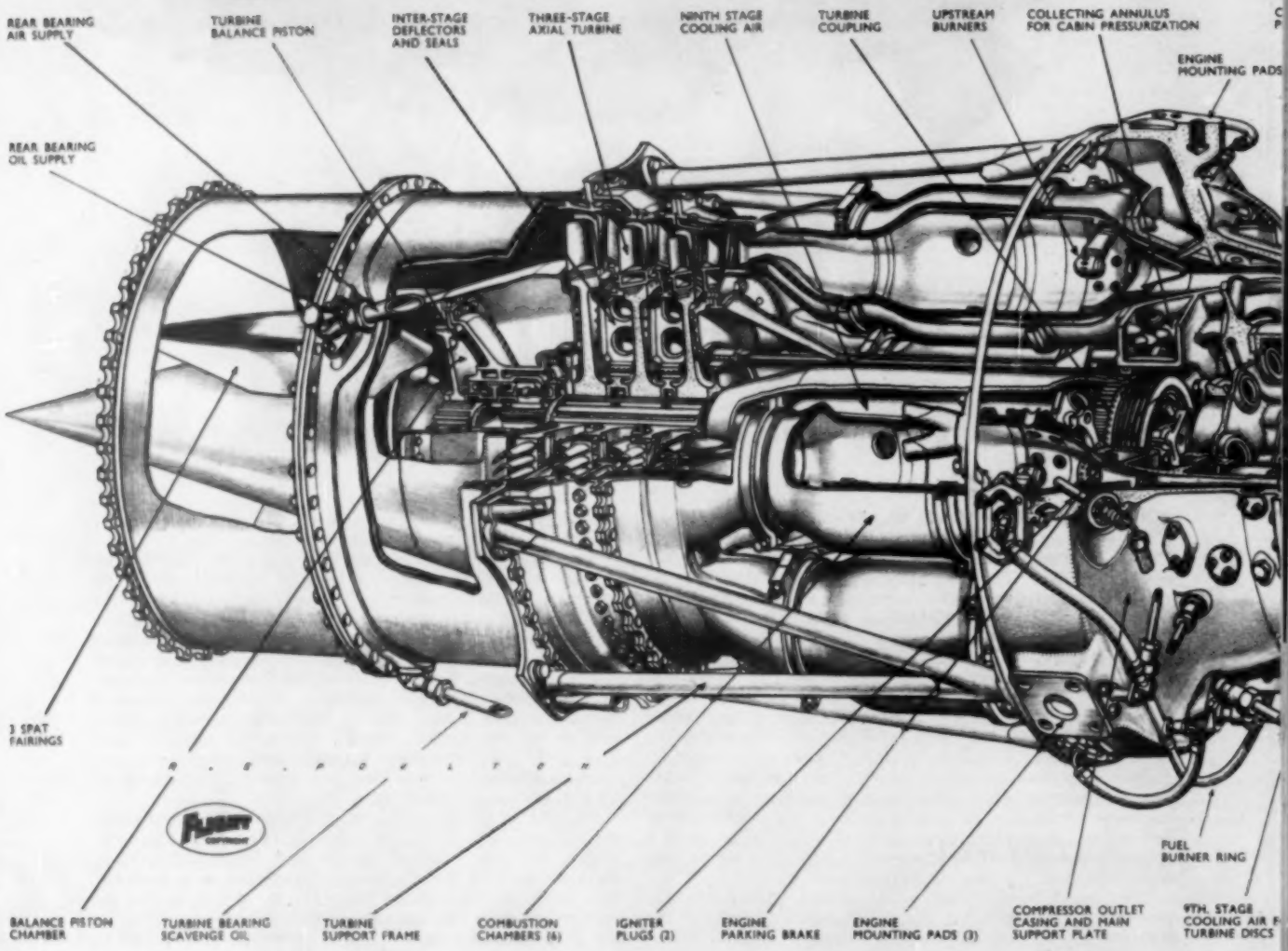
The resulting engine appears to be first class in every respect. There is no doubt whatever that this is largely due to extensive rig testing back in 1951—patient work which has now paid off handsomely. The description of the engine which follows starts at the intake and follows through the gas path, ending up with the airscrew drive and accessories. The account concludes with notes on the progress of the engine to date and its applications.

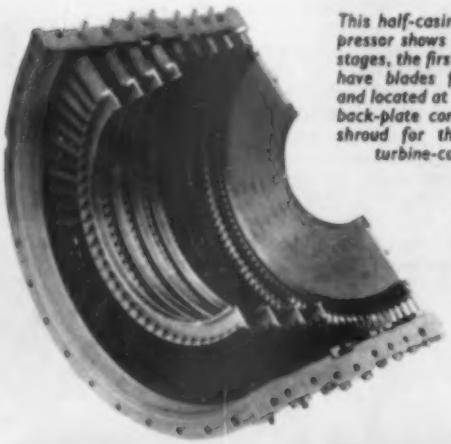
The entire gas path was fully flow-tested before the first engine was built, and the overall losses were found to be lower even than the severe estimate. Bends and kinks have been reduced to the absolute minimum and a very high aerodynamic efficiency has been obtained. The path starts at the direct ram annular intake around the spinner. The whole



From the rear, the support plate shows the six combustion-chamber diffusers and, centrally, the parking brake. This casting in ZT-1 alloy forms the basis of the whole engine.




REAR BEARING AIR SUPPLY
TURBINE BALANCE PISTON
INTER-STAGE DEFLECTORS AND SEALS
THREE-STAGE AXIAL TURBINE
NINTH STAGE COOLING AIR
TURBINE COUPLING
UPSTREAM BURNERS
COLLECTING ANNULUS FOR CABIN PRESSURIZATION
ENGINE MOUNTING PADS
REAR BEARING OIL SUPPLY
3 SPAT FAIRINGS
R · E · P · O · S · I · T · I · O · N
FUEL BURNER RING
BALANCE PISTON CHAMBER
TURBINE BEARING SCAVENGE OIL
TURBINE SUPPORT FRAME
COMBUSTION CHAMBERS (6)
IGNITER PLUGS (2)
ENGINE PARKING BRAKE
ENGINE MOUNTING PADS (3)
COMPRESSOR OUTLET CASING AND MAIN SUPPORT PLATE
9TH. STAGE COOLING AIR F
TURBINE DISCS



This half-casing of the compressor shows all nine stator stages, the first four of which have blades fully shrouded and located at each end. The back-plate contains a static shroud for the ninth-stage turbine-cooling air.

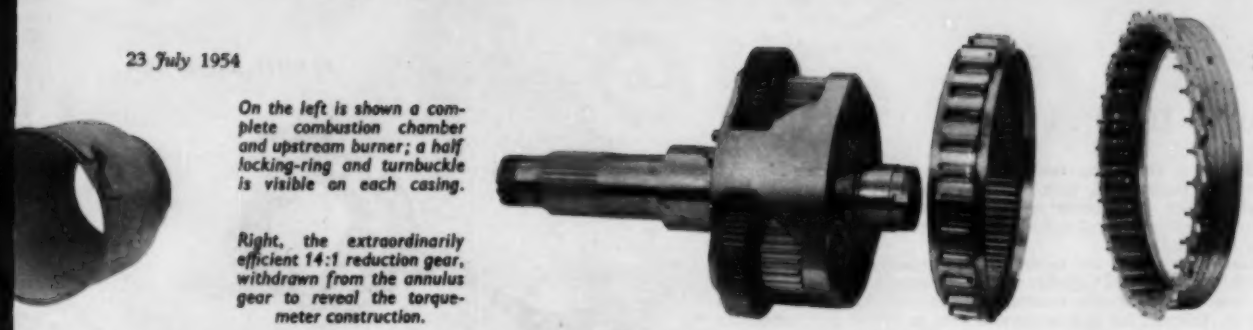
PRINCIPAL DATA

Single-shaft turboprop with 10-stage compressor, six combustion chambers and three-stage turbine.

Diameter over cowling, 36-$\frac{1}{16}$in; length from front of airscrew shaft to end of tailcone, 122$\frac{1}{2}$in.; frontal area of cowling, 7.1 sq ft; net dry weight, 1,575 lb + 2$\frac{1}{2}$ per cent; dry weight with starter and airscrew governor, 1,661 lb; jet-pipe weight, 7.6 lb per foot run.

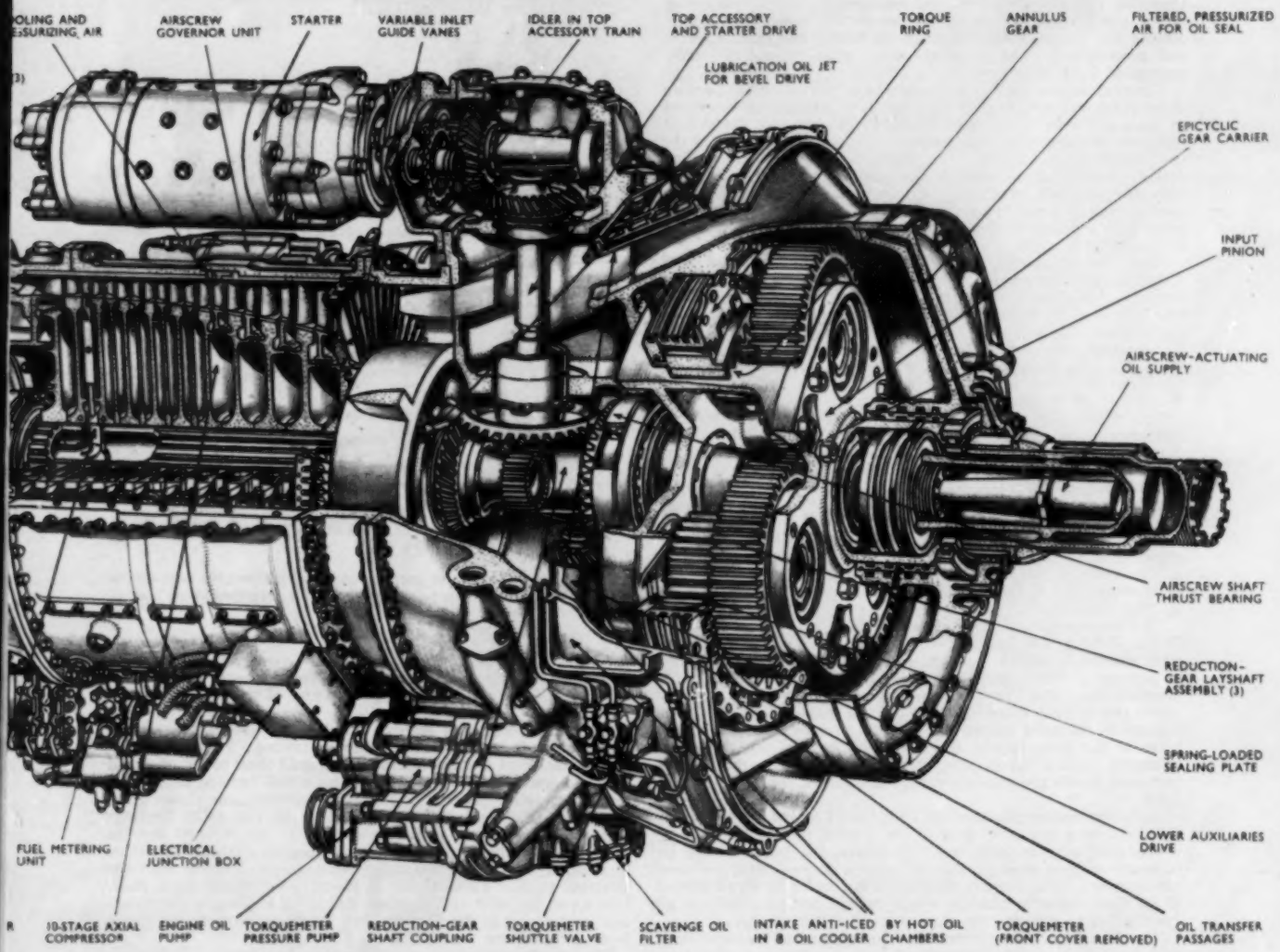
Airscrew, Rotol four-blade hydraulic unit with diameter between 12ft and 16ft; direction of rotation, left-hand viewed from rear; reduction gear ratio, 0.0714, 0.0838, 0.0912 or 0.0972 to 1.

I.C.A.N. Performance (Note: Elands under development will give very much greater power): Sea-level static take-off, at 12,500 r.p.m., 2,690 s.h.p. at 0.697 lb/hr/s.h.p. (3,007 e.h.p. at 0.624 lb/hr/e.h.p.; altitude performance in I.C.A.N. 30,000ft atmosphere at 400 m.p.h. T.A.S.: operational necessity at 12,500 r.p.m., 1,575 s.h.p. at 0.554 lb/hr/s.h.p. (1,880 e.h.p. at 0.463 lb/hr/e.h.p.); maximum continuous at 12,000 r.p.m., 1,325 s.h.p. at 0.566 lb/hr/s.h.p. (1,570 e.h.p. at 0.478 lb/hr/s.n.p.); cruising at 11,500 r.p.m., 1,130 s.h.p. at 0.573 lb/hr/s.h.p. (1,310 e.h.p. at 0.493 lb/hr/e.h.p.). Oil consumption, one pint per hour.



On the left is shown a complete combustion chamber and upstream burner; a half locking-ring and turnbuckle is visible on each casing.

Right, the extraordinarily efficient 14:1 reduction gear, withdrawn from the annulus gear to reveal the torquemeter construction.



NAPIER ELAND . . .

front end of the engine is formed from a large casting in RZ-5 magnesium alloy, which houses the reduction gear and incorporates the intake and six radial spats, two of which house the cover drives. The intake has a 2:1 area ratio, resulting in an accelerating flow which preserves laminar characteristics and prevents break-away from the radial spats.

To afford complete protection against ice, the inner wall of the intake is warmed by oil splash from the reduction gear, and the outer wall is heated by eight oil jackets through which the scavenge oil is pumped before it is returned to the pressure side of the lubrication system. Each jacket is formed from a thin magnesium-alloy casting, ribbed for strength, Argonarc-welded along its edges to the outside of the intake casting. A single flow of oil passes alternately through the jackets and the leading edges of the radial spats; in warming the intake the oil is itself cooled sufficiently to obviate the need for a separate oil-cooler, so saving weight and complication and eliminating cooling drag.

At the rear of the intake is a row of variable-incidence guide vanes which are anti-iced by fifth-stage air from the compressor; this air is passed into the leading edge of each vane to the outer end and back down the trailing edge to exhaust into the main stream at the inner diameter, where it impinges against the leading-edge root of the first-stage rotor blades. Discussion of these vanes, hereafter referred to as v.i.g. vanes, will be resumed later.

The Napier company are justifiably proud of the Eland compressor, which is small and light and has exceeded its design pressure ratio of 7:1 at a mass flow of 31 lb/sec with only ten stages of blading. The hub/tip ratio is 0.7, this being a compromise resulting in the moderate maximum r.p.m. of 12,500.

The rotor assembly is built up of conventional single discs held in flank-fitting splines on the large-diameter tubular rotor shaft of S.107 steel; discs one to seven are of aluminium alloy and the last three are steel. All fixed and moving compressor

NAPIER ELAND . . .

blading is of aluminium bronze. Napiers have used this material from the outset and, with its high fatigue-strength and easy machinability, have never regretted their choice. The company virtually developed and tightened the relevant chemical specification of D.T.D.197.

The rotor blades are secured conventionally by fir-tree roots, which are all nipped together axially between stages five and nine to damp out umbrella modes of vibration; the modes are, of course, different for each stage and tend to cancel each other out. The stator blades are all held in single-stage half-rings made from light alloy. Those in the first four stator stages are fully shrouded and the remainder are cantilever with the exception of the ninth stage, which carries the static shroud for turbine-cooling air. All are pushed in from the back of the retaining ring and peen-locked. The rings are then bolted to the two half-casings of L.51 alloy.

The compressor shaft is supported in a ball and roller bearing at the front and a roller bearing at the rear, where it is connected to the turbine by a gear-type coupling. To prevent the engine from windmilling, a parking brake is fitted at the rear end of the compressor shaft. Shown in a detail sketch, this unit has an Al-Fin bonded drum with a cast-iron lining. The brake is manually operated by the starting lever, the positions of which are run, dump, positive coarse-pitch, and brake. If required, the brake can be actuated hydraulically, and all Elands have drillings to supply such power.

From the compressor, the air passes through the support plate which virtually forms the basis of the whole engine. Cast in the new ZT-1 alloy, it is an impressive example of the founder's art and weighs 79 lb finished. It was, in fact, the first large casting in this alloy, the contractor being Sterling Metals, Ltd. The plate carries three pads upon which the engine is mounted in the aircraft, and also incorporates the diffusers of the six combustion chambers, a central hole for the shafting and a form of integral Warren-girder bracing to carry the loads.

The combustion chambers are Lucas tubular assemblies and their exceptional efficiency reflects the close co-operation between the two companies. Early in 1951 a chamber inlet was thoroughly tested not only as a straight diffuser but also with simulated wakes and velocity profiles. As a result Lucas had complete traverse data before they began work, and this preliminary investigation has been more than justified. Upstream injection is employed, the burners being of a simple swirl type with an 80-deg spray angle so that, during the starting cycle, fuel is thrown directly at the igniters provided in two chambers. These igniters are high-energy K.L.G. units fed with H.T. current from the Rotax ignition system.

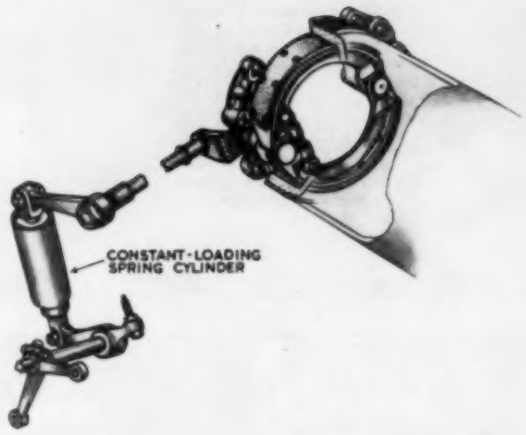
The materials used are aluminized S.84 for the casings and D.T.D.703 for the flame-tubes. The latter have conical noses with annular openings through which the primary air swirls in to perform a complete 360-deg helical loop without appreciable pressure-loss. The fuel burns rapidly in this low-speed primary zone with a total flame-length always less than 9in, and combustion is complete before the tertiary air enters through large holes in the flame-tubes. Some 0.75 per cent of the total flow is passed around the outside of the flame-tubes at the rear to cool, and relieve the pressure differential across, the turbine entry duct.

Each combustion chamber can be removed in five minutes without disturbing any other part of the engine, merely by undoing a clamping ring at each end. Similarly, the burners may be removed without draining the fuel supply lines—a most welcome achievement. The burners themselves are cooled by P, air passed down their shrouds, and the whole system performs well on all standard turbine fuels even at very low fuel/air ratios.

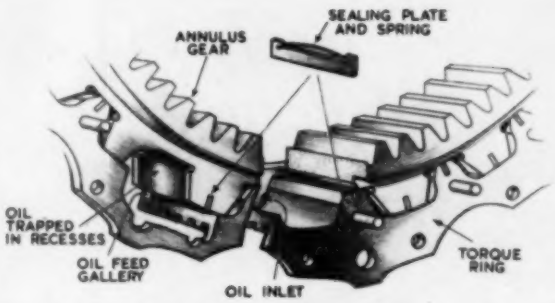
The Eland has three turbine discs, all splined to the same shaft and housed in a fabricated-sheet casing containing the three nozzle assemblies. The overall pressure ratio is 5.5 : 1 and the design is such that the exit swirl is low for all operating conditions, thereby minimizing jet-pipe loss. Further, the propelling-nozzle area has been chosen to give optimum performance under altitude cruise conditions.

The rotor discs, of Jessops H.40, are discussed later. They are mounted on flank-fitting splines on the turbine shaft, which is supported at the rear by a ball bearing and at the front by the gear-type drive coupling. The complete rotating assembly of the engine is thus mounted in but three bearings and is so arranged that gyro-couple loads at the centre bearing are substantially cancelled.

Turbine rotor blading of Nimonic 90 material is used in stage one and Nimonic 80A in stages two and three. All blades are secured by fir-tree roots so broached as to permit the usual limited tip-rock. The nozzle blades are hollow castings in X.40 material; the first-stage blades are secured by inner and outer rings, but stages two and three have inner and outer platforms and are bolted to the external casing. The inter-stage seal plates, which carry seals at the inner diameter and cooling scrolls on each face,



The parking brake is mounted on the rear of the compresser shaft. It is externally operated, the linkage being interconnected with the high-pressure shut-off cock and dump valve and the c.s.u. feathering lever.



This close-up of the annulus gear and torque ring shows the construction of the torquemeter, the principle of which is described in the text.

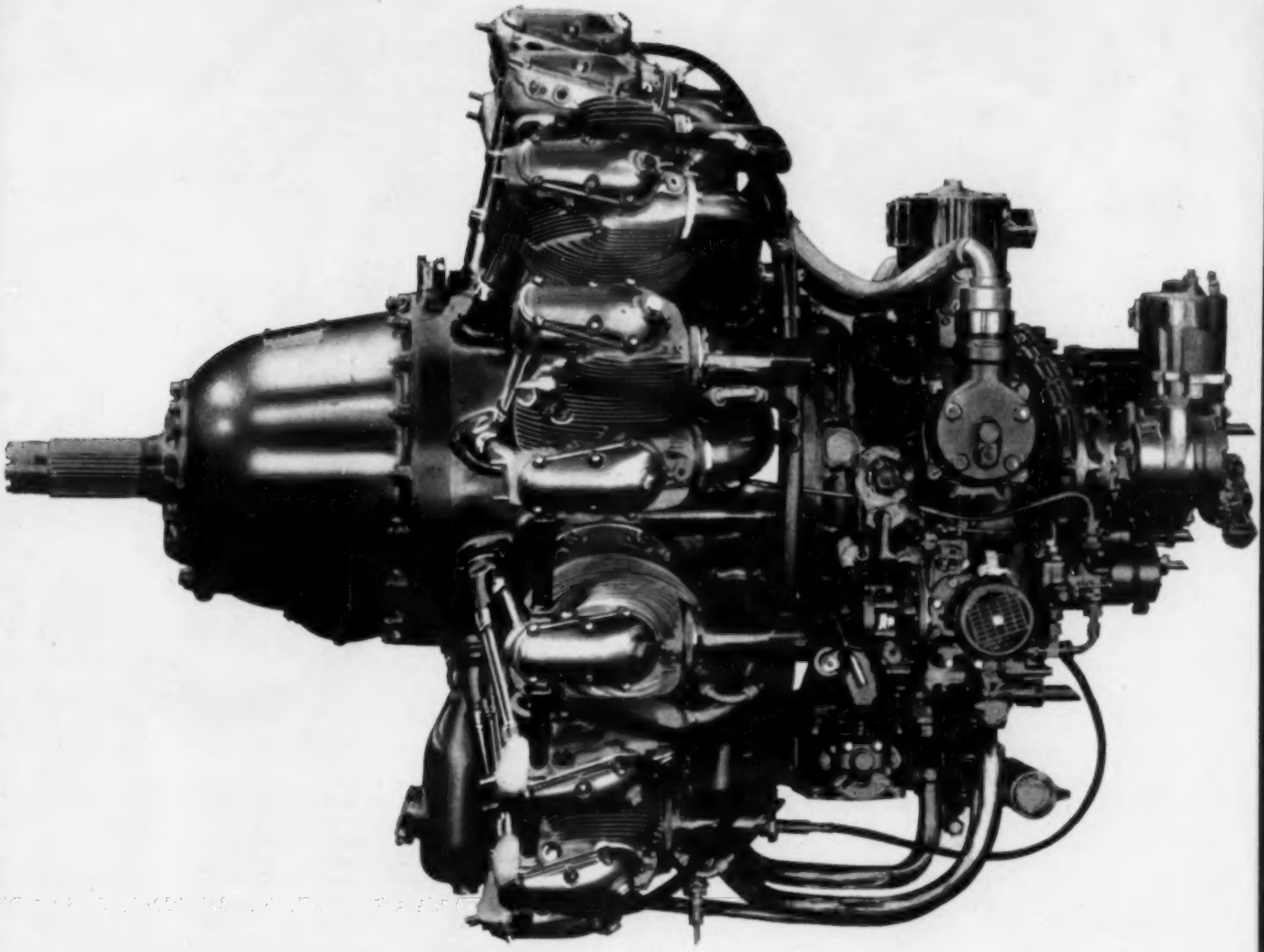
are mounted from the nozzle rings by swinging links attached to several of the stator-blade roots. Differential expansion is thus permitted while maintaining concentricity of the seals under all conditions.

The drive from the turbine through the compressor to the reduction gear is shown in the large drawing. From the compressor the drive is imparted through a quill shaft to a high-speed input pinion supported at the rear by a ball bearing and at the front by a roller bearing. This pinion drives three planet gears having integral layshafts, each mounted on two roller bearings and carrying a planet pinion meshing with the internal annulus gear. The combined planet gear and layshaft assembly is carried in a roller bearing in two halves of a carrier integral with the airscrew shaft. This carrier is, in turn, supported by a roller bearing at the front and by a ball and roller bearing in the reduction gear casing at the rear, the ball bearing absorbing the thrust from the airscrew.

The whole gear is designed to extremely advanced techniques and, although highly stressed at the design power of 2,700 s.h.p., has successfully been run for long periods at over 3,500 s.h.p. The geometry of the gear is such (as the drawing shows, the drive "loops the loop" in the reduction gear) that tooth deflections largely cancel out. The writer can vouch, from visual inspection of components, to the claim that all the main-drive teeth mesh right across their faces at all torques.

A trial 14 : 1 reduction gear was fun at full power in a "face-to-face" rig before the first Eland was built, and mechanical efficiencies exceeding 99 per cent are normally attained. Some credit for this result is due to the fact that the gear is completely self-centring, and the quiet running and low heat-loss to the oil confirm the excellent results.

The built-in torquemeter consists of an annulus gear and a torque ring, each having several paddle-shaped members carrying spring-loaded sealing vanes. The annulus gear is located inside the torque ring, the paddle-shaped members of each being interposed and spring-loaded against the annular walls between the opposite members by the sealing vanes. The intervening spaces form the high- and low-pressure chambers of the torquemeter and



ALVIS

LEONIDES

The Alvis Leonides — 550 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power / weight ratio 1·45 lb. (0·657 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Royal Navy, the Royal Air Force and Commercial Operators.

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NAPIER ELAND . . .

allow movement of the annulus gear. During normal operation, high-pressure oil is supplied to the high-pressure balancing chambers and then leaks across the sides of the vanes to fill the low-pressure chambers. The chambers are separately interconnected by annular passages; drain-oil escapes to the engine sump through ports in the torque-ring front cover.

As the torque increases on the annulus gear, the vanes move in relation to those on the torque ring, increasing the inlet port area, and thereby increasing the oil pressure in the high-pressure chambers until the pressure is sufficient to balance the torque. Movement of the annulus gear also increases the exhaust port area to facilitate drainage of the now-greater leakage of oil from the low-pressure chambers.

In the reversed torque condition, the ports in use for normal torque are closed by the relative movement of the annulus gear and torque ring, and other ports are uncovered to reverse the functions of the high- and low-pressure chambers. By suitable connections to the pressure-balancing chambers the torquemeter can be used to give signals for operating safeguard devices in the event of component failure.

Although the differential-pressure signal from the torquemeter is linear with torque, the low-pressure signal has its peak at zero torque. This feature provides a powerful signal if failure occurs. The safeguard unit consists of an arrangement which moves to the "guarding" position when the low pressure is above a given level. The safeguard unit is rendered inoperative by a cock during starting and running up.

Engine tests have consistently shown that the accuracy of the torquemeter over the normal power range is well within plus or minus one per cent of the calibrated dynamometer readings.

The Eland has extensive provision for internal cooling, pressure-balancing and sealing. The front face of the first-stage turbine disc is cooled by air bled at the maximum possible pressure from two holes drilled through the inner wall of each diffuser in the support plate, the latter also embodying an integral annulus from which this air is fed to the turbine. It is noteworthy that the abrupt 90-deg turn of the air bled from the diffuser produces momentum separation of all water in the engine air; thus, any catchment of ice-cold water is not flung against the hot turbine disc but is passed into the combustion chambers.

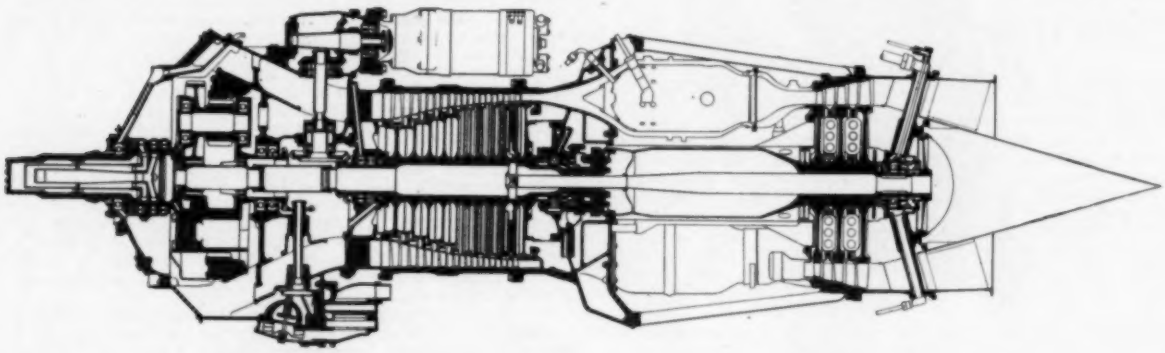
It may be appreciated that from some points of view efficient combustion chambers are a drawback. In the Eland, for example, the total pressure-loss across the entire combustion system is less than 5 lb/sq in, and this has to suffice for the extraction of cooling air and its passage through three quite lengthy pipes to the metering orifices which admit to the annular chamber forward of the first turbine. From here the air flows between the front face of the disc and the front seal plate, through a scroll attached to the seal plate, and exhausts across the rotor blade roots to the trailing edge. The object of the scroll is to lengthen the path of the cooling air up the face of the disc.

Further air is tapped from the ninth compressor stage, again with almost complete water separation, and passes to the hollow shaft *via* a static shroud. This shroud removes the free-vortex flow which would otherwise produce a near-sonic airspeed, and thus prevents loss of available pressure. This air is then led to the rear face of the first turbine disc, both sides of the second, and the front face of the third. By way of the rear end of the shaft, this static pressure is also communicated to the turbine balance-piston chamber, and maintains the end-load on the rear bearing at 500 lb—the minimum residual load to prevent skid during acceleration.

The rear face of the last disc and the turbine bearing are both cooled by fourth-stage air, which is filtered and piped externally. Tappings from the filter also supply air to cool the housing and inner race of the compressor rear bearing, and to pressurize the seals at the airscrew and accessory bearings. The factor governing cooling of the turbine discs is that, by metering the flow to each disc-face, all three disc rims are maintained at the same temperature. By this means, the lightest possible discs are used, with the best material employed in the most efficient manner.

A small supply of air—not enough to warrant a vortex breaker—is also obtained from the fifth stage, and this is taken forward, through the hollow shaft, to anti-ice the v.i.g. vanes and supply pressure to the compressor-balance chamber. In addition, cabin-pressure air can be extracted from a delivery flange on the support plate, at a rate of up to half-a-pound per second, and this is automatically compensated for by the control system.

The engine-control system itself is entirely Napier in design and manufacture. The pilot's power lever actuates an interconnected airscrew governor and a fuel-metering unit which automatically compensates for changes in forward speed and ambient pressure and temperature. A special acceleration control prevents overfuelling and surging during acceleration, and a two-position cockpit lever re-sets the fuel-metering unit when cabin air is being tapped off. Other equipment includes a variable-datum turbine inlet temperature control, a torque-limitation device, automatic pitch-coarsening and a control for the v.i.g. vanes which is responsive to engine speed.



A pure longitudinal cross-section shows the logical layout of the engine. Each of the four main assemblies—reduction gear, compressor, combustion chambers and turbine—can be removed and replaced individually. The overall cowling diameter is just three feet.

The aim of the Napier designers has been to achieve a control which, while having the minimum possible lag, maintains the appropriate turbine-inlet temperature for each selected engine speed (the two parameters vary directly with each other) but which, at a given r.p.m., maintains the turbine-inlet temperature constant under all operating conditions. No details can be given of the type of turbine-inlet temperature sensing device used, but it can be said that the man-hours expended in the development of the Eland control system match the total time required by the rest of the engine.

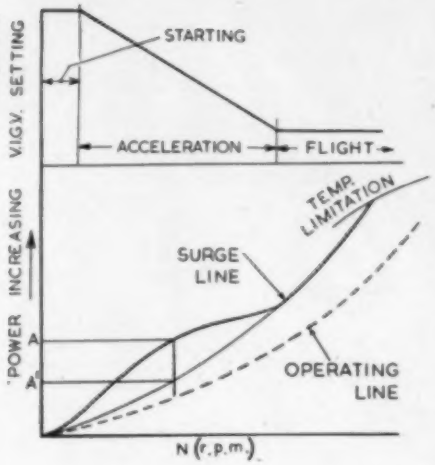
Very rapid starting and acceleration (2½ sec from idling to max. r.p.m.) is made possible by the v.i.g. vanes, the effect of which is shown by the small sketch on page 118. Their operation permits excess fuel to be fed during acceleration, the vane angle being precisely related to turbine-inlet temperature. It will be noted that the vanes are at constant incidence in all normal flight conditions.

The shape of the Eland is such that all the engine auxiliaries are accommodated around the compressor within the confines of the minimum-drag cowling. The drives for the accessories are taken from a bevel gear at each end of the central quill shaft. The quill shaft is looked upon as the deliberate "weak link" in the transmission, and its failure is safeguarded by driving the overspeed governor from the compressor side and the oil pump from the airscrew side.

The two drive-shafts lie vertically inside the twelve o'clock and six o'clock radial spats. Each drives a train of spur gears which transmit the drive to the auxiliaries mounted around the reduction gear casing on what are descriptively known as "banana-plates." The lower group of auxiliaries consists of the oil pressure and scavenge pumps, and torquemeter pump; the upper banana carries the remainder, including the fuel pump, tachometer generator, airscrew governor, synchronizing alternator and a drive to a remote accessory gearbox which can take out up to 250 h.p.

A development Eland on test with a 16ft Rotol airscrew, at the company's establishment at Coronation Road, Park Royal.

Precise control of turbine-inlet temperature permits extra fuel (AA¹) to be supplied during acceleration. The incidence of the intake vanes is constant during flight.



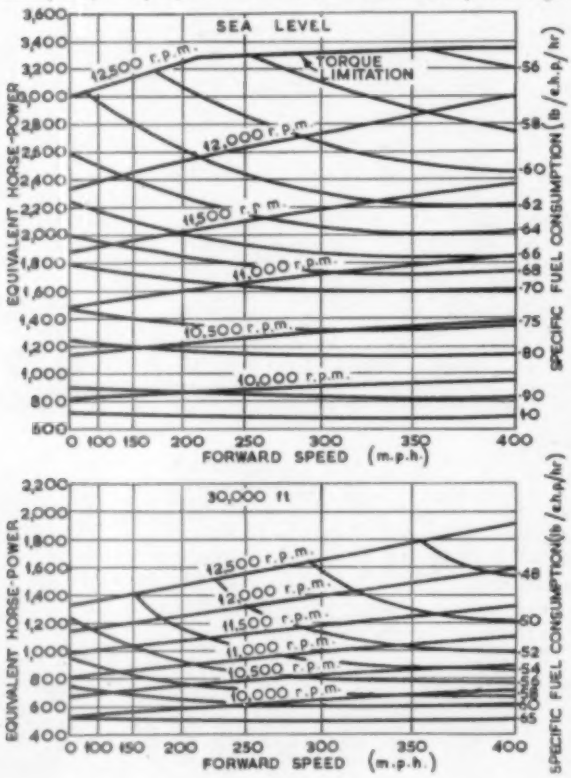
NAPIER ELAND . . .

The upper gear train also takes the drive from the starter, which is at present a Rotax electric unit, although the drive has been designed for turbine starters.

The auxiliary-drive gears are of spiral bevel form, and correct meshing is obtained by providing each pair of gears with mating conical tracks, machined at the same time as the teeth, which accept the axial thrusts and maintain perfect relationship under all conditions.

The Eland is lubricated by synthetic turbine oil (D.Eng.R.D. 2487) supplied at 80 lb/sq in pump pressure to the bearings, gears, torquemeter pump and, *via* a Purolator filter, to the airscrew governor. The pressure pump incorporates a relief valve and a static-head valve, the latter preventing flooding after shut-down.

These curves show the variation in equivalent horse power and specific fuel consumption with r.p.m., at sea level and 30,000ft altitude (I.C.A.N. atmosphere). They refer to the Eland at the NEI.1 development stage.



The reduction gear is lubricated and cooled by six sparge-type (i.e., sprinkler) jets mounted on the planet carrier and by jets impinging on the planet-shaft bearings; bearings for the high-speed pinion and airscrew-shaft are lubricated by splash. Pressure oil, kept cool by fourth-stage air, feeds calibrated jets on the compressor and turbine shaft bearings and the rear bearing on the airscrew shaft. The accessory trains are lubricated by calibrated jets or splash.

Scavenging of the sump—which is formed by the six o'clock intake spat—is effected by a gear pump, which returns the oil *via* a de-aerator and the hot jackets on the intake casting. The turbine and rear compressor bearings are independently scavenged by vane pumps, which are designed to function efficiently at all altitudes and conditions of manœuvre. The reduction gear is vented through a centrifugal impeller-type breather, which separates oil from the vented air.

In all installations, the Eland is carried at three points at 120 deg intervals around the support plate. From each mounting pad a pair of tubular struts extends back to the corners of a square frame on the firewall, the total of three triangular mounts providing complete acceptance of all loads. With the engine mounted, each combustion chamber can be removed in about 5 min, and replaced in 7 min, merely by passing it between the turbine-support struts. The latter carry the third-turbine-stage nozzle ring and, by undoing the bolts at this end, the turbine assembly can be removed in 7 min, the shaft "breaking" at the gear-type coupling without disturbing the installed engine in the slightest.

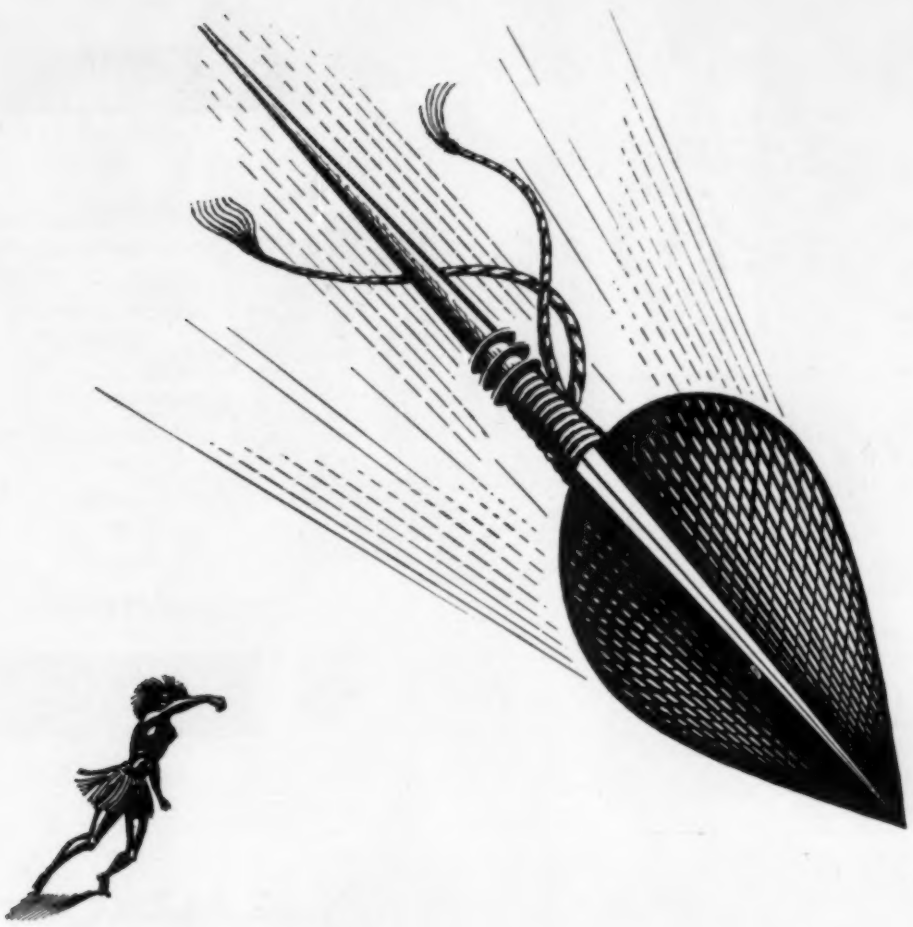
The cowled engine looks much like a Dart, and Napiers consider that, in the present state of the art, no 3,000 h.p. airscrew-driving engine can have a lower installed drag than has the Eland.

As previously stated, the Eland began as a private venture at the end of 1950. By 1951 most of the engine was "on the shop floor" and a rig compressor was running by January 1952. By August 1952 the first engine ran; M.o.S. backing, in the form of a development contract, was then obtained, and the Ministry's acceptance test was completed the night before that year's S.B.A.C. Show, on September 2nd. The Ministry's special-category test for flight clearance was successfully completed last month.

At present, a number of Elands have been running, and the quality of the engine is shown by the fact that one engine has completed well over 500 hr load-running without change of *any* component except turbine casings. Flight testing in a Varsity is imminent at Luton, and it is likely that this aircraft will perform at Farnborough in September with two Elands installed. Unfortunately, the existing Hercules firewalls of the Varsity have precluded the installation of cowlings of the proper size.

With one exception, referred to below, no details can be given of the applications of the Eland at the time of writing; but numbers of Elands are being made at Acton, and a large production potential exists at the company's production factory at Netherton, Liverpool, now making Avons and much non-aeronautical equipment. The only aircraft which has been publicly linked with the Eland is the Fairey Rotodyne, a very advanced form of helicopter, of which a prototype is now being made against a Ministry development contract. In this aircraft, two Elands are mounted on the small wings, and supply gas power to the tip-drive rotor at take off, afterwards transferring their output to airscrews for forward propulsion. It may be evident, even from this broad description, that the Rotodyne Eland has features not found in the fixed-wing unit described in these pages. It has, however, the same fundamental components, and a description will follow in the fulness of time.

W. T. G.



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NAPIER Eland

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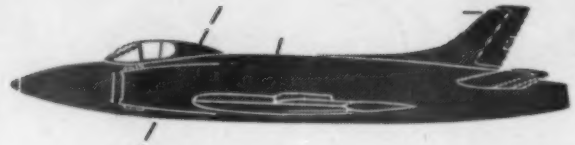

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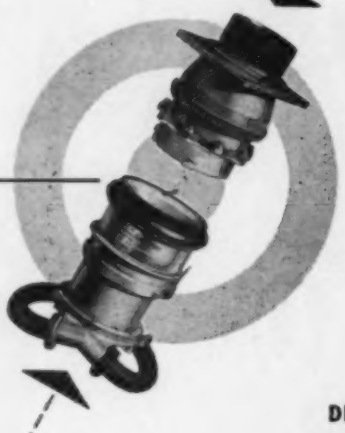

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RUSSIA'S AIRLINE SYSTEM

—an Official Description: Extracts from the 1954 Aeroflot Year Book

The cover of Aeroflot's year book shows an Il-12, standard Soviet transport, flying over the terminal building at Moscow Airport.

A FEW weeks ago, in response to an official request made earlier this year, we received from Russia an interesting document concerned with many aspects of aviation in the U.S.S.R. It is in the nature of a calendar and year book, dated 1954, and has apparently been prepared mainly for internal consumption and for the staff and passengers of Aeroflot, to which company we are indebted for the book.

The extracts which we quote below are those referring mainly to the work of Aeroflot. Although the information is not detailed—there are, in keeping with usual Soviet policy, no traffic statistics—it represents the most extensive official report on Aeroflot so far published in this country. Extracts from the year book are quoted below under their respective chapter headings:—

The Civil Air Fleet of the U.S.S.R. is the creation of the Soviet Government. The Communist Party, the Soviet Government, our inspired teacher Lenin, and the great Stalin who continued Lenin's work, foresaw the tremendous part that would be played by aviation in the development of the national economy, and gave much consideration to civil aviation. In 1923, when the Soviet people were reconstructing industry and agriculture after the liquidation of foreign military intervention and the end of the civil war, the Communist Party began the organization of the Civil Air Fleet, which was a new branch of the national economy. Conveyance of passengers and freight by air in the U.S.S.R. was started in 1921, but not in the form of regular air services. On February 9th, 1923, the Council of Labour and Defence passed a resolution on the creation of a civil air fleet. In the summer of the same year the first air service in the Soviet Union was inaugurated between Moscow and Nizhniy Novgorod.

Since its creation the Civil Air Fleet has become a powerful branch of the national economy, capable of carrying out large and important political and economic tasks. A dense and branching network of air services has covered the country and fast transport aircraft fly back and forth daily along these routes carrying over great distances passengers, mail and freight for the urgent requirements of national economy. . . . At the moment the Soviet Union occupies first place in the world as regards the length of its internal air routes, leaving the United States of America far behind.

Moscow, the capital, is linked by regular air services with the centres of all the union and autonomous republics, with regional and district towns and with many foreign capitals. Along the air routes of the Soviet Union tens of thousands of passengers and hundreds of tons of airmail and freight are carried daily.

A dense network of local air routes covers each republic, district and region. Along these routes fly light aircraft which carry passengers, newspapers and airmail to the regional centres, to

The extent of Aeroflot's route network, claimed to be the largest in the world, is shown by this official map.

RUSSIA'S AIRLINE SYSTEM . . .

workers' settlements, kolkhozes and sovkhozes (collective and state farms). . . .

In the course of the Fifth Five Year Plan for the development of the U.S.S.R. the transport air force is growing at a greater rate than before. Air freight turnover for 1955 will be at least doubled as compared with 1950. Aircraft and engine stocks are being considerably increased, and the network of air routes and airports equipped for 24-hour operation is also being greatly extended.

A great deal of work is being carried out by the "special purposes" Air Force of the Civil Air Fleet. Aircraft assist in the destruction of vermin, attacking grain and "technical" crops, forests, gardens and vineyards, in the mineral fertilization of winter crops and in sowing rice from the air. Pilots carry out patrol duty over large forests, keeping a look-out for outbreak of fire. They carry out air observation of fish and sea animals, deliver tens of millions of fish fresh from spawn for collective farm ponds and reservoirs, search for new pastures for cattle, carry incubator chickens for kolkhoz and sovkhoz poultry farms, and destroy with chemical poisons the larva of the malaria-carrying mosquito, the deadliest enemy to the health of the workers.

Over the whole expanse of our immense country there is spread a wide network of medical air stations where aircraft are kept ready night and day to fly doctors at a moment's notice to give immediate aid in cases of serious illness or accident.

Passenger Aircraft.—Along the Aeroflot air routes fly Il-12 and Li-2 passenger aircraft. The speed of the Il-12 when on scheduled flight is 186 m.p.h., and of the Li-2, 146 m.p.h. Local air routes between regional (krai) and provincial (oblast) towns and district centres are served by Po-2 and An-2 aircraft. Il-12 passenger aircraft are built to carry 18 passengers and Li-2 carry 14. Every passenger aircraft has a buffet, luggage compartment and toilet. On long-distance aircraft such as those flying between Moscow and Khabarovsk, Moscow and Tashkent or Moscow and Alma-Ata, the crew includes a steward.

All aircraft flying along air routes are equipped with modern navigational facilities which ensure regular and safe flights both by day and by night in difficult weather conditions. During the journey two-way radio communication is maintained between the aircraft and airports. Dispatchers, who keep a check on the flights from the ground, inform crews of weather conditions along the route. At night both landing and take-off is carried out with the aid of special radio and lighting equipment. . . .

This Aeroflot flight captain, Pawel Jakimow, is a Hero of the Soviet Union.

The Moscow-Vladivostok Air Route extends for thousands of kilometres crossing almost the whole Soviet Union from west to east. The route passes by way of the most important administrative and industrial centres such as Kazan, Sverklovsk, Omsk, Novosibirsk, Krasnoyarsk, Irkutsk, Ulan-Ude, Chita, Khabarovsk, to the shores of the Pacific Ocean. Along the whole of its tremendous length the route is joined by numerous subsidiary air links which act as feeder lines.

Many district and regional centres situated along the Moscow-Vladivostok route have become large junctions for air communications. Thus this air route together with its feeder lines connects the eastern regions of the R.S.F.S.R., the Far North and Sakhalin with the whole air network of the country. Along it there is a steady flow of passenger, freight and postal services covering tremendous distances. As it is connected at Moscow and Irkutsk with international airlines leaving the U.S.S.R. for the west and the east, the route also provides a constant, active air link between the Pacific coast and the Atlantic Ocean.

Along the whole Moscow-Vladivostok air route, airports have been built with air terminal buildings, technical services, modern two-way radio facilities and lighting equipment for take-off and landing of aircraft at night. The air terminal buildings along the route provide all comforts necessary for passengers. There are waiting rooms, rooms for mothers and children, restaurants, buffets, hotels, post and telegraph services, hairdressers, book and newspaper stalls of "Soyuzpechat*" and cloakrooms for hand luggage. Good roads have been built to the airports, which are served by motor buses and taxis.

Along the whole route, as on all the subsidiary air routes joining it, passengers, freight and mail services continue all the year round. First-class fast aircraft built in the U.S.S.R., modern equipment of technical ground services and two-way radio communications guarantee a high standard of frequency, regularity and safety of flight both in summer and winter. Airliners fly day and night without interruption to provide services for passengers and to ensure the prompt delivery of periodicals and newsprint, airmail and urgent freight. More than half the distance between Moscow and Vladivostok is covered by night. . . .

COMPARATIVE AIR AND RAIL JOURNEY TIMES

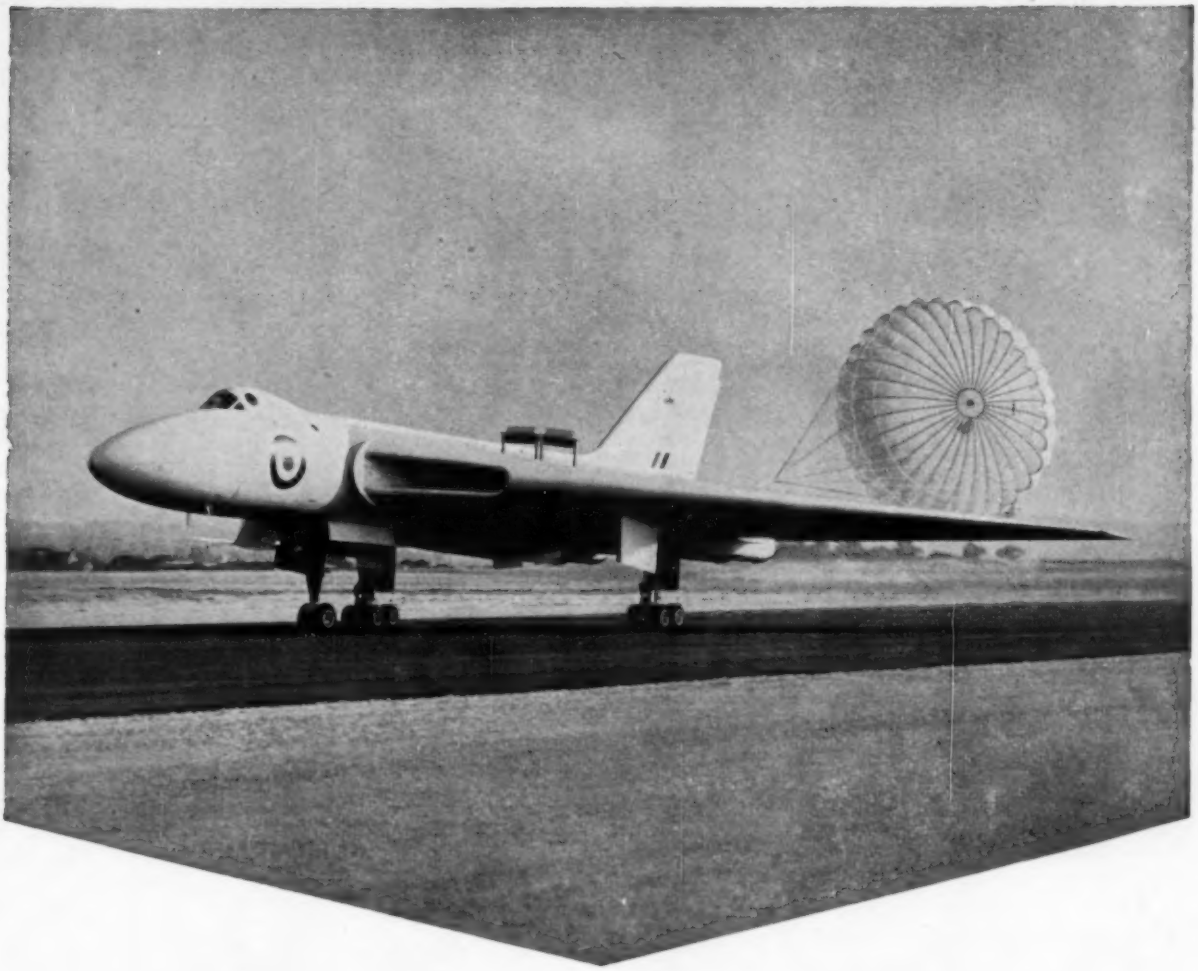
From	To	Air hr min	Rail hr min
Moscow	Astrakhan	7 30	53 15
,, ...	Kiev	2 30	24 7
,, ...	Leningrad	2 35	10 50
,, ...	Minsk	3 20	16 13
,, ...	Omsk	12 0	61 48
,, ...	Rostov	5 25	29 23
,, ...	Stalingrad	4 50	30 54
,, ...	Vladivostok	40 35	220 5
Kiev	Odessa	3 5	18 0
Minsk	Adler (Sochi) ...	9 5	65 32

Moscow Airport.—Vnukovo is Moscow's main air gateway. Through this airport—which is one of the largest in the world—passes the main stream of passengers, freight and mail for Moscow, and from Moscow along the air routes of the Soviet country.

Moscow is connected by direct air routes with all the capitals of the Union's Republics, with the industrial and cultural centres of the Soviet Union, with all the countries of the camp for peace and democracy—Poland, Czechoslovakia, Hungary, Rumania, Bulgaria, Albania, Mongolian Peoples' Republic, China and the German Democratic Republic. Regular passenger aircraft also

* *Central Administration for Printed Matter Distribution.*

Most of Aeroflot's services are flown by Il-12s, as shown above, although a number of Russian-built Dakotas (Li-2s) are still operating. The Li-2 (left) is landing at an airport in North Caucasus after flying from Moscow.



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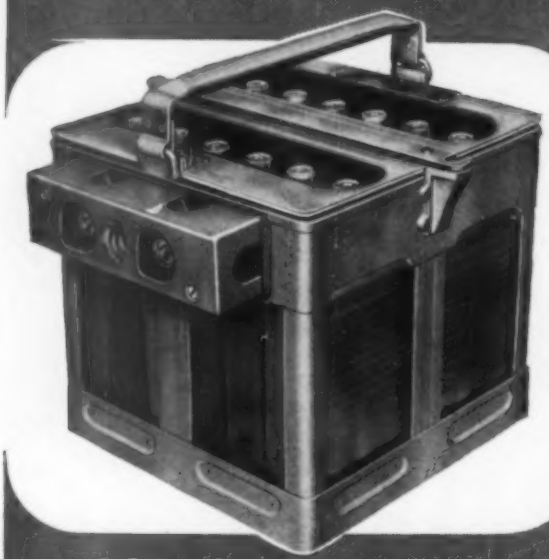

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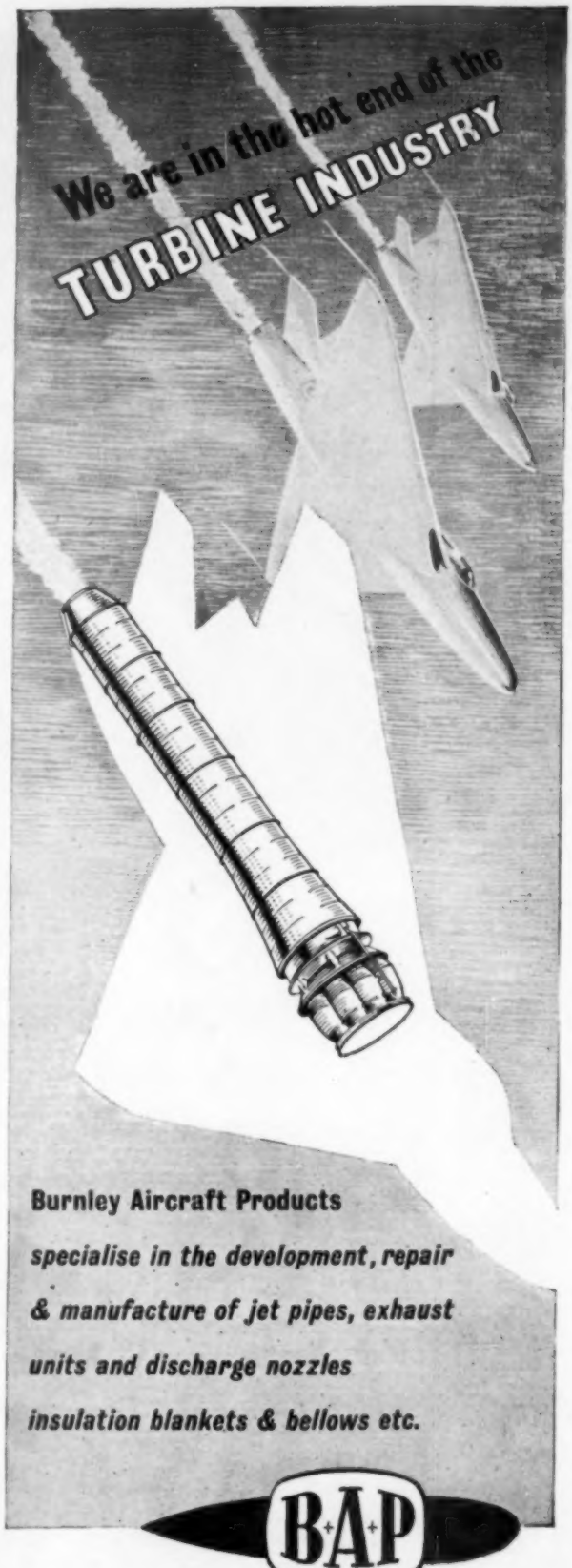

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Khabarovsk is the scene of this picture, showing an Il-12 and a line of Li-2s (Russian-built Dakotas).

RUSSIA'S AIRLINE SYSTEM...

leave Vnukovo for Afghanistan, Austria and Finland. . . .

For 24 hours a day, all the year round, whatever the weather conditions, work at the airport does not stop for a moment. To give an idea of the size of its work, it is enough to say that outgoing aircraft have in a year transported passengers equal in numbers to the inhabitants of a large town, and the quantity of freight and mail would be equal to that loaded on scores of heavy railway trucks [once again, no statistics!—Ed.].

In the central airport everything is subordinated to one object, to ensure a regular and safe flight, to serve attentively the needs of the passengers. The modern ground radio and lighting with which it has been equipped makes it possible for aircraft to land and take off at any time during the 24 hours under bad weather conditions. The air routes leaving Moscow are equipped with the most perfect technical devices, which make flying possible all the year round by day and by night. The airport dispatcher maintains radio communications with all aircraft leaving Vnukovo for hundreds of kilometres, until they reach the area where operation is taken over by the next airport. Dispatchers direct the aircraft, tell the crew their flight altitude and give them information on the weather conditions along the route. Aircraft flying into Moscow are directed in the same way. . . .

Between Moscow and Vnukovo airport there is a comfortable bus and taxi service. Buses run according to a timetable every 25 to 30 minutes. The first bus leaves Sverdlov Square at 5 o'clock in the morning, the last at 1.15 at night. Taxi service operates for the whole of the 24 hours.

The time to take a seat in a departing aircraft is also announced by radio. The airport duty officer accompanies the passengers to the platform. Hand luggage is carried to the aircraft by porters. On the airport premises the passengers are served free of charge. At the aircraft the passengers are met by the aircraft steward. He helps the passengers to find their seats and shows them where to put their hand luggage, he explains how the armchairs with the reclining backs can be used, explains the individual ventilators and lighting, and informs them about the various cold snacks which are to be had in the aircraft refreshment room.

Besides the Central airport in Moscow there is a second airport, Bykovo, from which aircraft leave for Sverdlovsk, Chelyabinsk, Simferopol, Syktyvkar and other towns. Bykovo airport is 50 minutes' travelling distance by electric train from Kazan Station.

The Moscow Town Air Communications Agency sells single, return and transit tickets for aircraft, accepts orders for the transport of luggage and freight, and gives information on air services.

Tickets are available for sale in advance five days before the aircraft is due to leave. Tickets may be ordered by telephone for delivery to the passenger's home. Information on freight transport will be given over the telephone.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Decca and V.O.R.

THE article entitled "Decca in Action" (*Flight*, July 2nd) aroused great interest among the members of the French Institute of Navigation. It has thrown a new light on the problem of aerial navigation whose outline was set out in the French magazine *Le Monde* a few months ago.

It seems that the moment has arrived for the international organizations which control the technical aspects of aerial navigation to reconsider the operators' general requirements in the light of experience with various equipment.

The V.O.R. system, which consists of directional high-frequency beacons having a certain angular accuracy, but a restricted range except at very high altitudes, has at the moment acquired a certain notoriety. The still-open controversy between the V.O.R.-D.M.E. (azimuth distance) type and the Decca (hyperbolic) -type systems may lead to many difficulties and produce many reactions, but commonsense seems to dictate a definite choice and standardization on one or other system in order to obtain a desirable efficiency and economy of operation.

Now European Decca coverage already exists while V.O.R. infrastructure is only in the planning stage. With I.C.A.O. and I.A.I.A. support Decca coverage is rapidly extending over European routes and into as yet unequipped areas such as the Middle East and North Africa. Plans for chain construction and preliminary work have passed the project stage and there is no obstacle to the establishment of a single, homogeneous aerial guidance system over the whole face of the Old World.

Indeed it seems surprising that the mere requirement for passenger safety has not obliged transport operators to make general use of a system, which, through the Flight Log, gives the navigator an exact pictorial indication at any moment of his position on the map. I.C.A.O. recommendations for a standardized system of short-, medium- and long-range navigation are wholly met. They are not, however, satisfactorily fulfilled by the V.O.R. system, at least at present, if only because V.O.R. cannot be used for both aerial and marine navigation. Yet already the existing Decca chains are providing effective and continuous position fixing for both fixed- and rotary-wing aircraft and ships.

How would it affect elementary economic principles if every different ship and aircraft required a special beacon and receiver system? To sum up, fundamental considerations of economy and safety must lead both air and sea transport operators who desire regularity and safety for their systems to advocate standardization, which in the present stage of concrete realization appears to indicate simply the development of the Decca system.

P. HUGON,
Secrétaire Technique de l'Institut Français de Navigation.
Paris VIIe.

Agricultural Requirements

TWO Antipodean correspondents (July 9th) state that a high-wing aeroplane layout is undesirable in a machine used for agricultural purposes.

This misapprehension is, I believe, often accepted as sound reasoning. Its origin, of course, lies (as indicated in Messrs Dillon's and Davis's letter) in the fact that the majority of high-wing monoplanes do not give the field of vision required for agricultural and similar work.

The fault is not, however, inherent in the high-wing layout, but is purely a matter which is not generally considered a design requirement. An admirable example of a high-wing monoplane which does not suffer from this restricted field of pilot vision (or from any of the other disadvantages mentioned by your correspondents, for that matter), is the Prestwick Pioneer.

It would be interesting if your correspondents would quote any example of a low-wing single-engined machine being used anywhere in the world for regular work of an agricultural nature. The disadvantages of the low-wing layout are very considerable in this work, from the point of view of low flying, ground handling, and operations from poor surfaces.

I would certainly endorse your correspondents' surprise at the limited interest shown by the British aircraft industry in the enormous potential field of agricultural flying.

Northam, North Devon. L. M. KELSEA-WILLIAMS,
Man. Dir., Dragon Agricultural Air Services, Ltd.

[A valuable effect of a low wing is to deflect spray or dust to the underside of foliage—Ed.]

Airliners in Warpaint

YOUR issue containing John Stroud's Imperial Airways survey was sold out before I could get a copy but I've read Mr. J. E. Bowyer's letter and the short article "On the Beach" in other numbers and both tempt one to a spot of reminiscence.

I don't think the three Goldens—*Horn*, *Fleece* and *Hind*—were ever taken over by the Air Ministry. Certainly *Golden Hind* was ours in 1944. I was B.O.A.C. coxswain at Kisumu when she flew out in July from the U.K. piloted by Capt. R. P. Mollard and I serviced her arrival in my control launch. Mollard, a very fine pilot, was commodore of the F.B.s on the "Horseshoe Route." (He's now general manager of Malayan Airways here in Singapore.)

After a visit to Durban, *Golden Hind* returned to Kisumu and, on October 5th, piloted by Capt. Dudley Travers (whom Heaven preserve), left on a proving flight *via* Mahe, Seychelles, to Cogella, Ceylon. Thereafter she was based on Kisumu and flew a shuttle from Lake Victoria to Diego Suarez with R.A.F. personnel.

I was posted elsewhere in 1945, but heard she once had an

CORRESPONDENCE . . .

engine catch fire soon after take-off. Capt. Caspareuthus (who later founded Caspar Air Charter, Nairobi) was flying her. It caused a bit of a flap at the time but no evil resulted.

All of us at Kisumu thought *Golden Hind* to be a very fine flying-boat, but the problem was how to make a routine job out of a single aircraft. Had B.O.A.C. had six Hinds, or even the original three, we could, and would, have made good use of them, but both the others had been lost early in the war. One was wrecked at her moorings by a storm—was it at Lisbon, *circa* 1942? The other, if my memory is not stalling, was lost on a test flight with all hands, including one of our coxswains who was aboard at the time.

During the war B.O.A.C. was under the Secretary of State for Air and performed duties which were officially recognized as an integral part of the war effort. Maybe this is how the writer of "On the Beach" came to think the Hinds had been taken over by the Air Ministry.

I was aboard *Golden Hind* many times in 1944 but I do not remember the "beautifully panelled cocktail-bar" mentioned in the article. We should have been very glad in those days even if there had been a case of beer!

Singapore. G. ALAN HILL-REID.

I CAN confirm Mr. E. J. Newcombe's account of the fate of the last H.P. Hannibal (*Flight*, July 2nd).

To the best of my recollection, the aircraft was "XF"—*Helena*. She was repaired and test-flown at R.N.A.S. Donibristle early in 1941, but, after months of discussion about who should operate her and the best use to which she could be put, the old lady was abandoned.

The cabin was placed on stilts and used as a squadron office; it was found to be too hot in summer and too cold in winter and was eventually broken up.

I took a photograph of it when in use as an office and it was reproduced in one of the technical magazines; but, amongst other things during those hectic times, the negative was lost.

Ruislip, Middx. G. O. WATERS (ex-I.A.L. and Cmdr. R.N.V.R.)

FORTHCOMING EVENTS

July 17-24. International Gliding Exhibition, London.
July 18. Yorkshire Aeroplane Club: "At Home," Sherburn-in-Elmet.
July 18-25. Aero Club of Italy: International air week.
July 20-Aug. 4. B.G.A.: World Gliding Championships, Great Hucklow, Derbyshire.
July 24-26. World Model Aircraft Championships and Wakefield Trophy, Washington, U.S.A.
July 31. Ulster Flying Club: Newtonards rally.
July 31-Aug. 4. Trento Aero Club: Seventh air tour of the Dolomites.
Aug. 1-2. Vintage Aeroplane Club: Air rally and Chiltern Air Race, Denham.
Aug. 1-2. Northern Model Flying Gala, R.A.F. Station, Neasham.
Aug. 2-7. Aero Club de France: World Parachuting Championship, St. Yan, Saône et Rhône.
Aug. 6-8. Royal Danish Aero Club: Invitation rally, Copenhagen.
Aug. 9-11. Institute of the Aeronautical Sciences: Conference on turbine-powered air transport, Seattle, U.S.A.
Aug. 14. Royal Aero Club: National Air Touring Competition, Cranfield.
Aug. 28. Southern Aero Club: Goodyear Trophy Race, Shoreham.
Aug.29-30. Pescara Aero Club: Annunzio Trophy contest, Pescara, Italy.
Sept. 5. Saar Aero Club: Europa-Pokal display.
Sept. 7-12. S.B.A.C. Farnborough Display and Exhibition.
Sept. 9-12. Royal Aero Club: International invitation air rally, White Waltham.
Sept.25-26. Aero Club of Germany: Hanseatenflug international rally.
Sept.20-29. Fédération Aéronautique Internationale: 47th annual general conference, Istanbul.

THE INDUSTRY

Dowty Board Appointments

THE appointment of two directors and a chief designer is announced by Dowty Group, Ltd. Mr. E. J. Nicholl, B.Sc.(Eng.), A.F.R.Ae.S.—a director of Dowty Equipment, Ltd., Dowty Equipment (Canada), Ltd., and Dowty Auto Units, Ltd.—has been elected joint managing director of Dowty Equipment, Ltd. (in conjunction with Mr. G. H. Dowty) and managing director of Dowty Fuel Systems, Ltd. Mr. Dowty will continue to act as chairman of both companies.

Mr. F. J. A. Mangeot, A.C.A., a director of five Dowty companies—Equipment, Auto Units, Mining Equipment, Seals and Ashchurch Products—has been elected to the board of Dowty Fuel Systems.

Mr. R. C. Cussons, D.F.C., M.A.(Cantab.), F.R.Ae.S., assistant chief designer to Dowty Equipment, is promoted to become that company's chief designer.

Mr. Cussons served with the R.A.F. from September 1939 until December 1946, attaining the rank of squadron leader. He joined Dowty Equipment's undercarriage design department in 1946 and in March 1950 was appointed assistant chief designer.

Mr. E. J. Nicholl and (below) Mr. F. J. A. Mangeot and Mr. R. C. Cussons (right)

IN BRIEF

At an extraordinary general meeting of Rolls-Royce, Ltd., on July 7th, immediately after the annual general meeting, a resolution was approved unanimously increasing the authorised share capital to £10,000,000 by the creation of a further 4,000,000 shares of £1 each.

* * *

The London office of Vokes, Ltd., the filtration and silencing specialists, is now at 123 Victoria Street, S.W.1 (Victoria 4550).

* * *

Mr. W. B. Hickman, who retired as secretary of Westland Aircraft, Ltd., at the end of last year, has now been appointed registrar to that company.

* * *

Mr. S. W. Hoskins, technical director of I. V. Pressure Controllers, Ltd., and Mr. George Gadomski, financial director, are visiting Holland to discuss "a special high-pressure-valve project" with a well known aircraft constructor there.

* * *

Young men contemplating a career in the aircraft industry will find much useful guidance in a publication entitled *Your Career in this Air Age*. Issued by Short Brothers and Harland, Ltd., Belfast, and very fully illustrated, it describes the company's apprenticeship schemes.

* * *

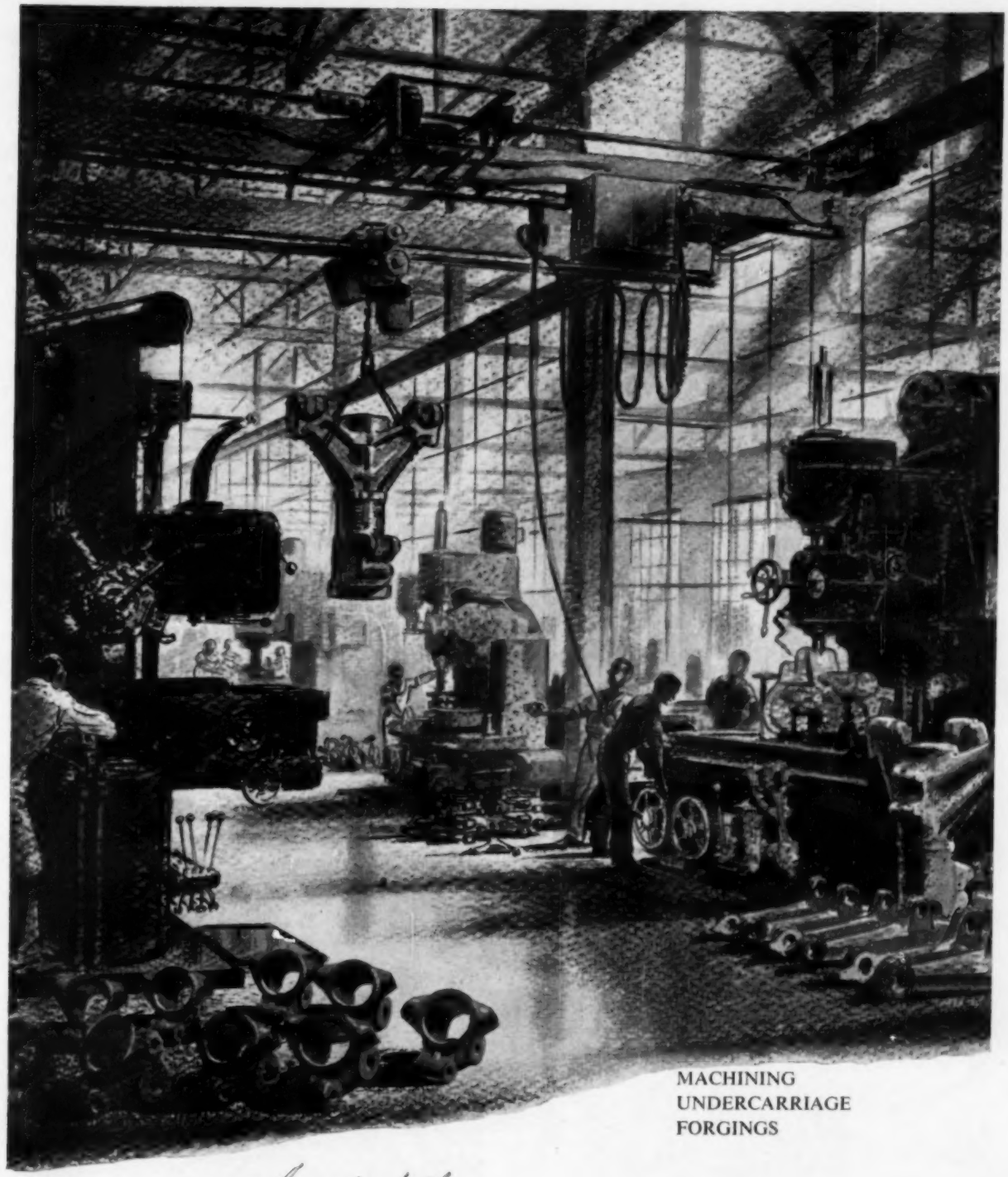
Well in advance of the Christmas season, the Ardath Tobacco Co., Ltd. (1/51 Worship Street, London, E.C.2), sends typical illustrations of the special gift packings of State Express 555 cigarettes which—for the first time since the war—are now available. One is a half-pint Sheffield pewter tankard containing an airtight vacuum tin of 50 cigarettes.

* * *

Mr. B. P. Fogerty has been appointed sales manager of the aeronautical consultant and sales firm of Cartwright Hamilton Aviation, 282 Kensington High Street, London, W.14. Engaged on transport, ferry and testing duties with Transport Command during the war, he has a total of 4,000 hours on 59 types of aircraft. Flying duties are included in his new appointment.

* * *

Simmonds Aerocessories, Ltd., Treforest, Pontypridd, Glam., have been granted design-approval by the Directorate of Instrument Research and Development, M.o.S., permitting them to design fuel-tank contents gauges of the capacitance type, and appropriate test gear, for Service aircraft. Simmonds Pacitor fuel contents gauges are, of course, well known and are fitted to many military and civil aircraft. A lightweight version has also been developed, and is already specified for several new aircraft.



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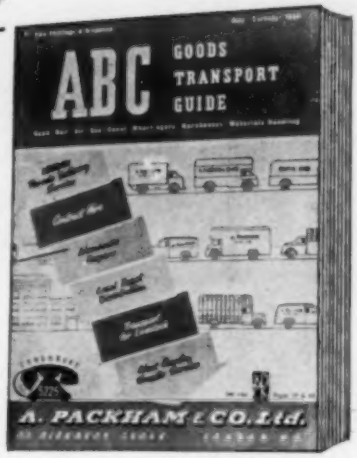

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CONTENTS

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PRIDE OF EIRE: Lined-up at Collinstown, Dublin, is the full Viscount fleet of Aer Lingus. All four of the new turboprop liners are named after Irish saints—St. Patrick (the flagship), St. Brigid, St. Laurence O'Toole, and St. Brendan.

CIVIL AVIATION

BOOST FOR B.O.A.C.

LAST Friday's announcement that B.O.A.C. had secured Government approval to buy additional American aircraft was not unexpected. The grounding of Comets was immediately followed by withdrawal of all the South American services and reductions of frequency on other routes; furthermore, no plans could be made for introducing Comet 2s, as planned, within the near future. All this occurred at a time when many of B.O.A.C.'s competitors were improving both the quality and frequency of their international services. Action taken to remedy this situation is outlined in the B.O.A.C. statement, as follows:—

"In view of the withdrawal of the Comets from service for a period, B.O.A.C. is proposing, with Government approval, to acquire additional Stratocruiser and Constellation aircraft. This step is being taken as it is clearly imperative that the Corporation should meet its world-wide traffic commitments pending the re-introduction of the Comets and delivery of the Bristol Britannia fleet. B.O.A.C. is accordingly in negotiation for the acquisition of six Stratocruisers from United Air Lines of America, two Stratocruisers from Pan American Airways and seven additional Constellation 749 aircraft, four of which are being obtained from Qantas Empire Airways, the Corporation's partner on the Kangaroo route to Australia. The Corporation will dispose of Constellation aircraft as Comet services are resumed and of Stratocruisers as they are replaced by Britannias."

Pan American and United will presumably receive dollars for their Stratocruisers, and it is possible that Qantas may have received British assistance in finding the hard currency for their new Super Constellation fleet (*Flight*, June 11th). The first Constellation from Qantas was expected to be delivered by today, and the first of the eight Stratocruisers (a Pan-Am machine) will be taken over at the end of August. Total cost of the additional aircraft is reported to be in the region of £4m.

At present B.O.A.C. are using ten Stratocruisers to carry first-class passengers to New York, Montreal and the Caribbean. The additional eight aircraft, some equipped for high-density tourist work, will probably be employed on the same routes. Acquisition of the seven other aircraft will bring B.O.A.C.'s Constellation fleet to a total strength of 19 (including a model 749 which is being bought from America, under separate Treasury approval, to replace the one lost at Singapore). This would make possible an increase in frequency on the busy Kangaroo and Springbok routes (to Sydney and Johannesburg). Some of the extra capacity, presumably, could also be added on the African and Eastern routes, now operated almost entirely by 22 Argonauts.

Fifteen four-engined airliners represent a sizeable fleet, and it might be expected that—even allowing for the need to increase frequency on under-worked routes, and to insure against long-term or even permanent grounding of Comets—B.O.A.C. would soon be in a position to resume the South American services. The Corporation informs us, however, that there are at present no plans for doing so. This seems unfortunate; the process of building up B.O.A.C.'s traffic and prestige in South America was a lengthy and difficult one, and the Corporation's goodwill must already be dwindling.

WITH AN INDEPENDENT AIR: Pictured at Blackbushe, shortly before departure for Nairobi on July 13th, is one of the six Hermes IVAs recently acquired from B.O.A.C. by Britavia, Ltd.—a subsidiary of the P. and O. shipping group, and itself the parent company of Silver City Airways. Britavia's Hermes have been equipped as 58-seaters to operate the company's new trooping contracts to Nairobi and Cyprus.

SOVIET AIR SERVICES

ALTHOUGH it discloses very little technical data, the Aeroflot publication reviewed on pages 119-121 of this issue provides food for some interesting thoughts on the Russian airline system. One of the most surprising features is the apparent lack of a four-engined airliner. Western airline executives would recoil from the idea of operating the world's longest domestic air route with a comparatively small medium-range twin. But although Aeroflot's Trans-Siberian service is inadequate by Western standards, it must be considered in relation to a low traffic potential and absence of any competitive stimulus (other than a train service taking over nine days).

However, the Aeroflot year book does make this guarded reference to the prospect of an I1-12 replacement: "It was with a great sense of responsibility that the designer [S. V. Ilyushin] tackled the task of designing a comfortable and reliable passenger aircraft. He listened attentively to the pilots and engineers of the Civil Air Fleet, and made use of their remarks and suggestions for the further improvement of existing craft and for developing new passenger aircraft of even better design. Today this new aircraft already exists. In its flying and technical data and particularly in its economy, it represents a fresh advance in the development of the Civil Aviation of the U.S.S.R."

Economy is certain to be the compelling factor behind the development of new Russian airliners. Soviet passengers have virtually no experience of flying in large pressurized transports of modern design, though a 66-passenger four-engined transport, the IL-18, was reported four or five years ago.

The Aeroflot year book states that every aircraft carries a book in which passengers may record complaints or suggestions. It may be significant that none of the complaints are reproduced. All the published comments, in fact, strike a single harmonious note of unqualified praise for Aeroflot aircraft and pilots, all of whom have "great and faultless flying experience, and who possess great flying and cultural education . . ."

Although not throwing any clear light on the quality of service provided by Aeroflot, some of these rather naïve comments are worth quoting, together with the accompanying text:—

The L-4905 twin-engined aircraft has the following remark by the famous Armenian author and Stalin prizewinner Gevorka Emin, noted in the book which it keeps for remarks and suggestions:—

"Faultless piloting, excellent service, sympathetic and polite attitude to passengers, thus making a flight from Moscow to Yerevan easy and almost unnoticed."

"We made tremendous flight from Moscow and Ulan-Batar strictly

TOUCHDOWN: With 84 minutes' flight time to its credit, the Boeing 707 makes its first landing, at Boeing Field, Seattle. The maiden flight, which took place on July 15th, is reported on the opposite page.

CIVIL AVIATION . . .

in accordance with the time table"—writes A. Merikin a post-graduate student of the Institute of Oriental Studies of the Academy of Science of the U.S.S.R., in pilot Kalinovskiy's book for remarks and suggestions. "The pilot flew the aircraft with skill. We passengers received constant care and attention."

"I flew from Moscow to Kaliningrad very well, quietly and comfortably," writes A. Smirnov a post-graduate student of Technical Sciences. "The aircraft was piloted by qualified personnel of our (U.S.S.R.) Soviet Civil Air Fleet. Honour and praise be to them."

Stalin prizewinner N. I. Bogolyubov, the people's actor, entered the following in the book for remarks and suggestions of the L-4893 aircraft:—"I thank the crew for their excellent and attentive concern for the passengers. Thank you comrade pilots."

Moscow teachers Davydova, Morgel and Voronova, who flew to Soviet Lithuania, wrote:—"We cordially thank the crew for the excellent air journey from Moscow to Vilnius. The aircraft was clean and comfortable. Service was cultural, hearty, affable. That is how Soviet pilots should be."

SKYWAYS IN GERMANY

ONE of the largest British independent airlines, Skyways, Ltd., announced last week that the company will have a "substantial minority interest" in a new German civil airline, Deutsche Lufttransport Gesellschaft. The only information recording the work of the new company and its relationship with Lufthansa, the proposed German national airline, is contained in the following Skyways statement issued on July 14th:—

"The Deutsche Lufttransport Gesellschaft will work in the closest co-operation with the Lufthansa, which it is anticipated will shortly be in operation. German participation will be shared by the widest national interests and may include trade union representatives. The constitution of the board will be determined within the next few days. The initial nominal capital will be DM.500,000 (£42,500). The aircraft fleet in the first instance will consist of three Dakotas, but will be implemented as necessary from Skyways' four-engined fleet, which is the largest independent aircraft fleet in Europe."

To supplement their present fleet of Yorks and Dakotas, Skyways are acquiring ten Hermes from B.O.A.C. Although the company no longer holds any Government contracts for regular trooping flights, and is at present operating only one international scheduled route (the Crusader service to Cyprus), a Skyways spokesman states that other commitments are keeping the fleet extremely busy. Skyways have bases in the United Kingdom, Hamburg, Malta, Cyprus and Beirut.

The importance of the company's Middle East interests is underlined by the news that Mr. Richard de Graaff Hunter has joined Skyways as director of their Middle East companies. Mr. de Graaff Hunter recently resigned from B.O.A.C. after ten years with the Corporation, during most of which period he was managing director of Aden Airways, Ltd. He was also vice-chairman and chief executive of Arab Airways, formed a year ago and based in Amman, Jordan.

UNIVERSAL LOADER: The hinged boom of this Fourways electric mobile conveyor makes it suitable for loading any type of aircraft. Described in "Flight" of July 9th, the conveyor was demonstrated last week at London Airport; the aircraft is an Argonaut of B.O.A.C.

THE GOVERNMENT'S PRINCESS POLICY

QUESTIONS about the future of the Princess flying-boats were raised in the House of Commons on Monday. The Minister of Supply, Mr. Duncan Sandys, explained that discussions with airline operators who were interested in the Princesses were not yet concluded. Explaining why these discussions were taking longer than had been hoped, he said that there were only a limited number of concerns who were prepared to take on a novel enterprise of this kind. There was the problem of facilities at the overseas bases, and there was also the problem that engines of sufficient power to run these flying-boats economically on a commercial basis were not yet available, and therefore there were certain elements of uncertainty in the whole proposal.

In reply to Mr. Frank Beswick, who had asked the Minister to give priority to the development of engines for the Princess, Mr. Sandys said that he could not agree to give priority to these machines, when there was as yet no definite use for them; he was not at all anxious to authorize the expenditure of large sums of public money on development of special engines exclusively for the use of these three flying-boats. Mr. Sandys added, however, that among the range of new engines which were being developed by the aircraft industry for aircraft of various types there was one which appeared to offer every prospect of being suitable for use in the Princesses.

EGYPTIAN MONARCH

THE B.O.A.C. transatlantic Monarch service, operated with Stratocruisers, is to be extended from London to Frankfurt and Cairo. From September 4th there will be a weekly return service to both these cities from New York and Montreal; the first westbound service originating at Cairo will leave on September 7th.

BOOKS FOR ENTHUSIASTS

A HELPFUL companion for the many thousands who make their way to the public enclosures at British aerodromes is *The Airport Visitor*, of which a fifth, revised edition has just been published. Contents include a list of registrations of all airliners likely to visit this country, together with brief details of each type; a guide to airline operators; and articles giving general and specific information on British airports. Copies can be obtained at the airports for 2s 6d or for 2s 9d (including postage) from the publishers—Penman Enterprises, Ltd., 202, Cheam Common Road, Worcester Park, Surrey.

For those whose interest in civil aircraft is not confined to transport machines, a complete register is essential. The official British civil register, correct to April 1st, is reproduced in John W. R. Taylor's *Civil Aircraft Markings 1954*. This latest edition contains several previously unpublished photographs. Also included are fleet lists of all overseas airlines serving the United Kingdom and—something new for spotters—a list of military serials carried by civil aircraft when trooping in the Canal Zone. Another list quotes serial numbers given by the Ministry of Supply to production civil aircraft and prototypes acquired for test purposes. This useful little *ABC* volume is published at 2s 6d by Ian Allan Ltd., Craven House, Hampton Court, Surrey. An addition to the *ABC* series, entitled *Helicopters*, has also been published by this company at 2s 6d. Mr. Taylor seems to have succeeded once more in cramming a quart of useful pictures and data into a pint-sized book.

TAKE-OFF: Four podded JT3Ls and the four-segment flaps, distinctive features of the Boeing 707, are seen to advantage as the prototype climbs away from Renton Airport

OFF TO A GOOD START

AMERICA'S first jet transport, the prototype Boeing Stratotanker/Stratoliner, made an impressive first flight on July 15th, taking off at 2.14 p.m. from Renton Municipal Airport, Washington, and landing 1 hr 24 min later at nearby Boeing Field. At the controls were Boeing's chief of flight test, A. M. "Tex" Johnston, and R. L. "Dix" Loesch; they reported "a beautiful flight and a beautiful airplane." The new Boeing became airborne in less than 2,100ft and had climbed to 700ft by the time it reached the end of the 5,400ft Renton runway. It was operating at a take-off weight of 110,000 lb, including 3,400 lb of flight-test equipment, compared with the eventual gross weight of 190,000 lb. The altitude limit for the first flight, 20,000ft, was reached 15 minutes after take-off.

The new jet prototype was rolled out of the Boeing factory on May 14th and eight days afterwards was damaged when a main undercarriage leg collapsed during high-speed taxying trials. Observers in this country have been impressed by the speed with which this damage was repaired and its cause rectified. The duration of the first flight suggests that—as in the case of the Comet 3— no unexpected characteristics were encountered.

THE PRICE OF FRIENDSHIP

LATEST news of the Fokker F.27 Friendship, two prototypes of which are under construction at Amsterdam, is that the estimated cost of the aircraft has been raised from £141,000 to £165,000. Labour costs and accessory prices are blamed for the increase. The manufacturers also announce that structural development has allowed an increase of the total usable wing fuel capacity—from 704 to 818 Imperial gallons. The additional fuel raises the economic stage distance from 810 to 1,000 statute miles at a take-off weight of 34,200 lb. Over this distance about 300 lb of cargo can be carried in addition to the normal complement of 28 passengers. The front part of the fuselage and the wing section of the first prototype are now taking shape in the assembly jigs.

BRITANNIA PROGRESS

IT might be inferred from B.O.A.C.'s decision to acquire a large additional fleet of American-built transports that the introduction of the Britannia is still a somewhat distant prospect. The Bristol Aeroplane Co. reports, however, that the programme is running to schedule and that 13 Britannia 100s should be in the hands of the Corporation by the end of 1955.

It is expected that the first prototype (now back in the shops for overhaul) and the first production aircraft will be flying within a month and that tropical trials will begin as soon as possible thereafter. Four production Britannias should have been delivered to B.O.A.C. by the end of 1954 and nine more will follow next year. B.O.A.C. have ordered 15 Mk 100s and 18 lengthened Mk 300s (with more powerful Proteus 755) of which eight will be the new long-range version; the Corporation also has an option on two more long-range Britannia 300s.

CIVIL WIRRAWAYS

IT is reported from Australia that two ex-R.A.A.F. Wirraway advanced trainers have been placed on the civil register. They will be used by Mr. A. W. Miller and Mr. C. E. Tadgell, principals of Super Spread Pty., Ltd., to spray a large area of Brigelow scrub. This scrub, which grows to a height of 50-60ft, will be treated with a hormone mixture and, after the effects have reached the roots (this takes some months) the owners will be able to burn off and clear the land.

Miller and Tadgell have already experimented successfully along these lines with Tiger Moths, flying 2ft above the tree-tops. Their Wirraways will be stripped of combat equipment, undercarriages will be fixed, and belly tanks fitted. In this form they will be capable of covering 100 acres per flight.

BREVITIES

LAST year K.L.M.'s operations showed a surplus of 10.4m guilders (nearly £980,000) compared with 5.7m guilders in 1952. Half the 1953 surplus will be allocated to a general reserve and the remainder is being distributed as a 4 per cent dividend.

* * *

Hunting-Clan Air Transport, Ltd., announce the appointment of Mr. John Robinson as sales promotion manager. Mr. Robinson's business career has been devoted largely to the development of air transport in the Far East. In the late twenties he was the agent in Swantow for the China National Aviation Corporation, which operated a daily service between Hong Kong and Shanghai, and in 1938 he acquired a controlling interest in the Far East Aviation Co., Ltd., of Hong Kong, and its subsidiary, the Far East Flying Training School.

* * *

Figures published by the British Travel and Holidays Association show that nearly one-third of the overseas visitors who came to Britain in 1953 arrived by air. The number of flying visitors was 218,310, out of a total of 632,560; the corresponding figures for 1952 were 177,510 out of 565,540. Of the 186,000 Americans who came to Britain last year, 81,000 travelled by air, whereas only about 15 per cent of the 63,000 German visitors used air transport. The most air-minded group of travellers were the Swiss: about half the 22,000 visitors from Switzerland arrived by way of London or Manchester Airports.

* * *

Last week's article on rearward-facing seats for transport aircraft mentioned three British independent operators who have adopted these seats. A fourth company identified with the use of aft-facing seats is Skyways, Ltd., who in fact were the first civil operator to equip large aircraft in this way.

* * *

The cost of chartering a S-51 helicopter, capable of carrying three passengers or 700 lb of freight a distance of 300 miles at 90 m.p.h., is at present in the region of £65 per flying hour. This figure is mentioned in a recent statement by Eagle Aviation who are acting as agents for Autair, Ltd. This latter company, which was recently responsible for making the first freight flight to the South Bank, operates three S-51s.

* * *

It was reported from Delhi last Saturday that the Indian Airlines Corporation had decided to buy five Viscounts to replace Dakotas on their main internal routes, with an option for further Viscounts at a later date. At the time of writing no contract had been signed and Vickers-Armstrongs were unable to confirm the report. For well over a year there has been intense competition between Vickers and Convair for the Indian order; there is confidence that the Viscount's performance in airline service during that period will ensure a victory for the British firm.

* * *

Delivery of the last of 45 DC-6Bs ordered by Pan American World Airways was announced on July 14th. Costing almost £21m, the P.A.A. fleet of "Super-6s" is the largest of its type in service. The airline also has three DC-6A freighters and between May and August next year will take delivery of seven DC-7Bs, valued at £5m, for non-stop transatlantic service.

"FLIGHT"
Photographs

A general view of the site at Camphill, Derbyshire, scene of the World Gliding Championships. Across the centre is the line of the competing aircraft's trailers; in the background the caravans and tents housing the various teams.

INTERNATIONALS

GREAT indeed is the variety of designs and ideas now on view and in action at Camphill. The World Gliding Championships, our report on which will begin in next week's issue, have brought to the home of the Derby and Lancs Gliding Club a fascinating selection of new sailplanes, together with the élite of the Western World's pilots. These *Flight* photographs give a brief indication of the Camphill scene: they were taken during last week's practice flying at the site.

The picture, right, shows the German HKS-1, one of the heaviest and fastest machines in the two-seater class. Note the wing-warping action, used in place of ailerons. The lower group: (Top left) Gerard Pierre, French national champion and strong contender for the World title, flies one of his team's two Breguet 901s. (Top right) American, all-metal, and a smooth ship—the new Schweizer 2-25, prior to its first winch-launch, with Stan Smith at the controls. (Lower left) The last take-off of the ill-fated prototype Zugvogel flown by Austrian pilot Alois Hasenknopf. Unfortunately the machine crashed near Hathersage, and the pilot, an instructor from Kufstein, was killed. (Lower right). There is no substitute for advertising: With determination and the knowledge that nothing replaces the wool, Belgian pilot Cartigny leaves the ground in his unambiguous Sohaj.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

ON SALISBURY PLAIN: The Duke of Edinburgh about to board one of the Bristol Sycamores during his recent visit to Army units. On the right is Capt. J. Spittal, O.C. Army Helicopter Unit.

Princess Margaret in Germany

DURING her recent four-day tour of British military units in Germany, Princess Margaret spent one day with the Royal Air Force, at Oldenburg and Ahlhorn.

It had been intended that Her Royal Highness should fly by helicopter to Oldenburg from Costedt, where she had been the guest of General Sir Richard Gale, but the bad weather necessitated an alteration in the programme; instead, she flew in the Viking of the Queen's Flight which had brought her from Britain.

At Oldenburg Princess Margaret reviewed a parade and presented a Squadron Standard to No. 20 Squadron (S/L. Ian MacDonald). Later she inspected the cockpit of one of No. 20 Squadron's Sabres.

After luncheon she drove 40 miles to Ahlhorn, where a demonstration of attack by napalm took place. Two aircraft dropped the canisters on dummy targets and the resulting fire was then snuffed out by the new fire tenders jointly developed by British and German engineers. Twenty-two of these tenders have been ordered by the R.A.F.

While at Ahlhorn Princess Margaret fired, by remote control, a burst of 20 mm cannon shells from the guns of a Meteor.

C.F.S. Reunion

AT Little Rissington last Friday the Central Flying School held its 42nd anniversary reunion dinner. In the chair was Air Marshal Sir John E. A. Balwin, who was commandant of the school from 1928 to 1930 and is now the president of the C.F.S. Association. The only other ex-C.O. present was A. Cdre. G. D. Stephenson, who now commands the Central Fighter Establishment. Principal guests were Marshal of the Royal Air Force Viscount Trenchard (deputy commandant when the school was first formed in 1912) and Mr. George Ward, Under-Secretary of State for Air, who, as a flight lieutenant in 1940 at Upavon, successfully obtained an A.1 classification. On Friday he flew down from Hendon in a Devon, arriving shortly before bad weather closed in on Little Rissington.

In proposing the toast of "The C.F.S." Sir John welcomed the guests and remarked that the annual reunion was becoming a highlight in the doings of the R.A.F. Replying, the commandant, A. Cdre. G. T. C. Paul, said he was diffident about speaking on behalf of C.F.S. (He is the first commandant not to have been a qualified flying instructor.) Of the year's work he said that the examining wing had carried out 2,732 tests on 46 different types, and in their "spare time" had re-written the pilot's flying manual. They had also made flying tests with jet aircraft to determine spinning characteristics. He announced also that Australia and New Zealand have both asked for the wing to visit their Air Forces.

Referring to the main task of the school, A. Cdre. Paul said that 300 qualified instructors had been produced in the past year. It was sad, he thought, to retire the North American Harvard, but he hazarded the guess that very shortly complaints about its characteristic noise would be succeeded by complaints of ceilings falling down by reason of supersonic bangs.

Another modern aspect was touched upon by the commandant when he said that C.F.S. now had three helicopters and hoped soon to be instructing on them. He was looking forward, he said, to the arrival of the first jet basic trainer.

Finally he announced that during the past year members of C.F.S. had been awarded nine Air Force Crosses and four Queen's Commendations.

On rising to speak, Lord Trenchard was accorded a tremendous ovation. He had been looking forward, he said, to coming to the reunion because "I didn't make C.F.S. or have anything to do with it, other than being a pupil who was told it was rather silly to fly at his age."

Shortly after joining the school, he said, he was appointed station staff officer, which meant he was responsible for setting the examination papers. He recounted to the assembly how he had set his own paper, sat for it, passed it, and had kept to "the same high standard" ever since!

In a more serious vein Lord Trenchard went on to say that right in the beginning, under Godfrey Paine, C.F.S. had a name for quality and had since been copied by

PRINCESS MARGARET studies the cockpit of a No. 20 Squadron Sabre. In attendance is Air Marshal Sir Harry Broadhurst, A.O.C-in-C. 2nd T.A.F. (Right) The Squadron Standard of No. 20 Squadron being marched past the saluting base after presentation by Princess Margaret at Oldenburg.

SERVICE AVIATION . . .

the whole world. He enjoined his listeners not to count heads—there were always a lot more useless than useful people in the world: "Whatever you do—numbers do not count—do it well and you will go through the opposition like a hot knife through butter."

As Lord Trenchard sat down there was tremendous cheering and clapping, and the orchestra in the gallery broke out into the famous Royal Flying Corps mess song, *The Young Aviator*, in which everyone present joined.

To Pilot the Duke's Aircraft

FOR the Duke of Edinburgh's tour of Canada, which begins on July 28th, W/C. H. A. Morrison, R.C.A.F., has been appointed Captain of the Duke's Flight. Earlier this year he piloted the Canadian Prime Minister, Mr. St. Laurent, on a world tour.

Cadet Interchange

DURING most of this week air cadets from Canada, U.S.A., Australia and Sweden have been arriving in this country on visits reciprocal to those of our A.T.C. abroad.

Each party, of which there are three, will make a tour lasting approximately three weeks. There will be visits to R.A.F. stations, places of historical interest and tours of London. Several days will be spent in Scotland and Wales. A highlight of each tour will be an invitation to visit the Prime Minister's home at Chartwell where, if engagements permit, Sir Winston Churchill hopes to meet them.

R.C.A.F. Appointment

IT has been announced that G/C. J. Birchall, O.B.E., D.F.C., R.C.A.F., has been appointed Military Adviser to the Canadian delegation to NATO.

G/C. Birchall will be remembered for his warning to Ceylon in 1942 on sighting a Japanese fleet approaching the island. A squadron leader at the time, he was flying a Catalina flying-boat of No. 413 Squadron, R.C.A.F., on patrol and was shot down shortly after sending the radio warning. For his initiative he received an immediate D.F.C.; and he was made an O.B.E. for outstanding service in prison camps on behalf of other prisoners of war.

Half-Yearly Promotions

BELOW is continued (from page 96, July 16th), the list of half-yearly promotions issued by the Air Ministry.

Flight Lieutenant to Squadron Leader: H. A. Olivier; D. B. Halcro, D.F.C.; R. A. C. De C. White, D.F.M.; B. C. Hornell; M. R. Alston; W. D. James; J. L. Ginns; R. F. Davis, D.F.M.; D. G. Sheppard, D.F.C.; G. B. Atkinson, D.F.C.; P. E. Berry, D.F.C.; J. E. Simmonds; J. R. Stoop; C. W. Cowan, D.F.C., D.F.M.; S. W. Daniel, D.S.O., D.F.C.; D. I. Slade; J. J. Deverill; N. W. Andrews; K. L. Charney, D.F.C.; R. T. Johnson; L. J. Browne; N. L. Bottome; J. J. Woods, D.F.C.; T. R. W. Froud; R. J. Colston; T. W. Monaghan; R. E. Paul; E. R. Bangor-Jones; G. W. R. Frampton; D. O. Luke; J. P. E. Peters; R. Waugh, D.F.C.; S. J. Houghton, A.F.C.; G. W. Bean, D.F.C.; A. E. C. Wilkie; P. J. Hearne, D.F.C.; H. V. Gwyther; W. F. Young; P. I. Evans; R. H. Smyth, A.F.C.; B. D. Davies; G. F. Dewey, D.F.M.; R. G. Smith; P. A. Stanford, D.F.C.; E. A. Jee; A. H. W. Gilchrist, D.F.C.; A. S. Haddon, D.F.C., D. F. Adcock; K. Ruskell, D.F.C.; D. P. D. Archer, D.F.C., D.F.M.; W. J. Malone; J. B. R. Battle; E. Bell, A.F.C.; J. S. Sargent, D.F.M.; J. H. B. Hutton; R. Whittam; J. H. Hedger; G. H. Davis, D.F.C.; G. Arkley; R. W. W. James; P. N. Boyle; R. E. B. Manson; L. G. A. Bastard; T. H. Hutchinson; J. C. Douglas, D.F.C.; C. W. Beasley; D. H. D. Tungate; R. N. Ayles, D.F.C., D.F.M.; G. D. J. King, D.F.C.; K. Scholes; J. D. Melrose, D.F.C.; L. J. Palmer; B. W. Slater, A.F.C.; D. W. Butler, A.F.C.; A. Knapper, M.V.O., A.F.C.; J. P. Britton; H. Coates, D.F.C.; A. C. Davies; S. Halliwell, D.F.C.; D. C. L. Kearns; R. Lingard, D.F.C.; W. E. Hamilton, D.F.C.; J. C. Steele; J. L. Barlow, A.F.C.; K. C. Wilson; R. J. Jarvis; A. Craig; S. D. Baldock, D.F.M.; E. L. Heath; G. O. Russell, D.F.C.; P. M. Walker, A.F.C.; E. A. J. Haskett; V. H. Hemming; J. F. Rothwell; A. M. J. Kent; A. Lloyd, A.F.C.; L. F. Wolsey; M. Penman, D.F.M.; F. Reid; C. R. Johnson.

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(To be concluded)

PRESENTATIONS: (Left) Air Marshal Sir Dermot Boyle handing the Ingpen trophy to S/L. H. M. M. Tudor, D.F.C. of No. 264 Squadron, the winners. (Centre) A.V-M. A. W. B. McDonald receives from Lady Coningham the Royal Yacht Squadron Gold Cup, won by the R.A.F. Sailing Association. (Right) F/S. E. T. E. Evans with his wife admiring the George Cross which he had just received from the Queen at Buckingham Palace.

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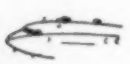

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that Applications Nos. 310 and 311 from the Lancashire Aircraft Corporation, Ltd., for normal scheduled services from Lympne to Beauvais and Ghent, respectively, advertised on Friday, July 16th, are for services to be operated in conjunction with British and French, and British and Belgian scheduled motor coach operators respectively.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made, in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections.

THE Air Transport Advisory Council also give notice that as and from August 5th, 1954, their address will be 3 Dean's Yard, Westminster, London, S.W.1. Tel.: ABBey 6791. [2349

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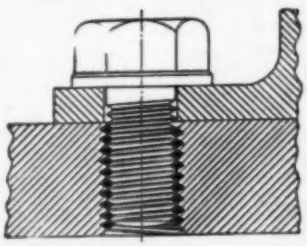

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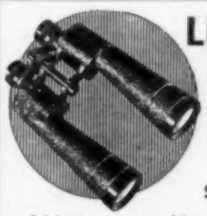

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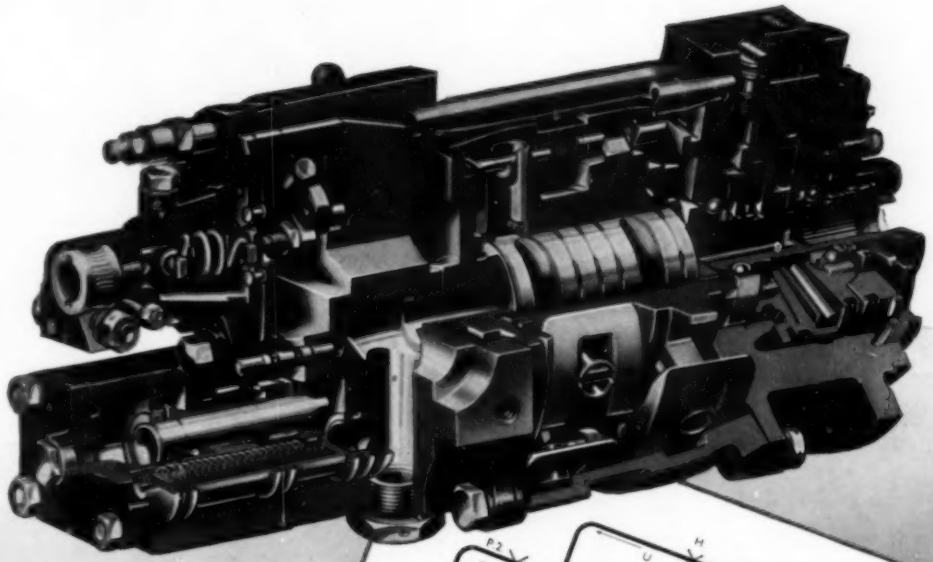

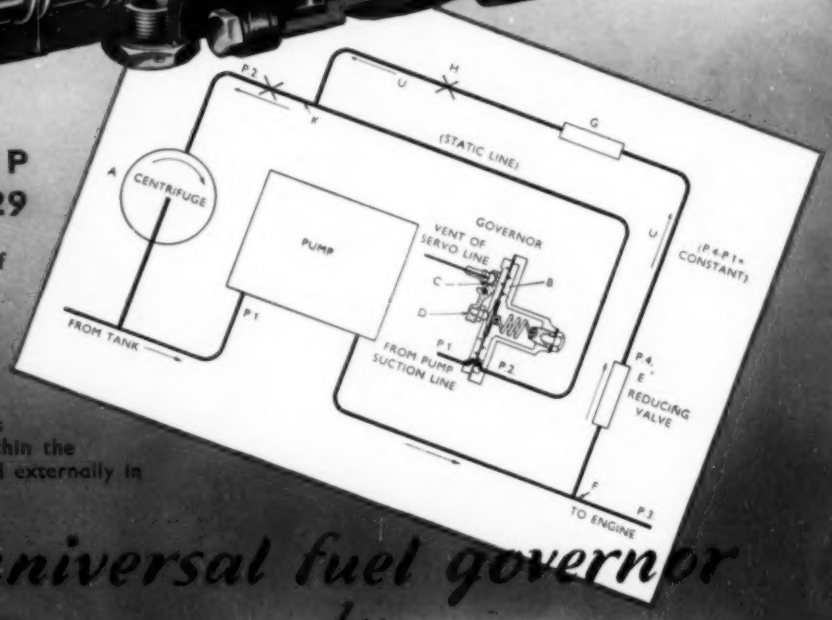

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